TM 5-4120-336-14

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL

AIR CONDITIONER, VERTICAL: COMPACT, SELF-CONTAINED, AIR COOLED, ELECTRIC MOTOR DRIVEN

115 VOLTS, A. C. 50/60 HERTZ, SINGLE PHASE

6,000 BTU/HR COOLING, 4,500 BTU/HR HEATING

(HARVEY W. HOTTEL MODEL CV-6-5/6-15)

FSN 4120-455-7673

This copy is a reprint which includes current pages from Changes 1 through 5.

HEADQUARTERS, DEPARTMENT OF THE ARMY

NOVEMBER 1973

WARNING

Disconnect the air conditioner from the power source before performing any maintenance on the components of the air conditioner.

WARNING

Avoid bodily contact with liquid refrigerant and avoid inhaling of refrigerant gas. Be careful that Refrigerant 22 does not contact the eyes. In case of refrigerant leaks, ventilate area immediately.

WARNING

Before removing any components from the air conditioner care must be taken to disconnect the input power to the unit. This will insure the safety of personnel and prevent damage to the air conditioner.

CHANGE
No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC *30 August 1974*

Operator, Organizational, Direct Support, and General Support Maintenance Manual AIR CONDITIONER, VERTICAL: COMPACT, SELF-CONTAINED, AIR COOLED ELECTRIC MOTOR DRIVEN 115 VOLTS, AC, 50/60 HERTZ, SINGLE PHASE, 6,000 BTU/HR COOLING, 4,500 BTU/HR HEATING (HARVEY W. HOTTEL MODEL CV-6-5/6-15) FSN 4120-455-7673

TM 5-4120-336-14, 30 November 1973, is changed as follows:
Page B-2. "Section II. MAINTENANCE ALLOCATION CHART" is superseded as follows:

Section II. MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Assembly group	(3) Maintenance Functions A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild	(4) Tools and equipment	(5) Remarks
01	CASING, GUARDS, GRILLES, DRAIN TUBES, PANELS AND FILTER													
	Guard, Coil	C 0.1							0 0.3					
	Cover, Access	C 0.1							0 0 2	0 0 5				
	Grille	C 0.1			C 0.1				0 0.2	0 0.5				
	Filter, Air	0 0.1		0 0.5					0 0.1					
	Frame Assy	C 0.1								F 0.5				
02	JUNCTION BOX ASSY													
	Relays	0 0.1	0 0.2						0 0.4					
	Transformer	O 0.1	O 0.2						0 0.5					
	Fuses	O 0.1	O 0.1						0 0.1					

(1) Group No.	(2) Assembly group	(3) Maintenance Functions A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild	(4) Tools and equipment	(5) Remarks
02	JUNCTION BOX ASSY (Cont'd)													
	Capacitors	0 0.1	0 0.2						0 0.3					
03	CONTROL PANEL ASSY													
	Switch		0 0.1						0 0.5					
	Thermostat Switch		0 0.1						0 0.5					
	Wiring Harness	0 0.1							0 0.4	0 0.3				
04	BLOCK-OFF PANEL ASSY													
	Panel							0. 0.1	0 0.1					
	Cover								0 0.1					
05	FAN ASSY													
	Guard								0 0.2					
	Impeller	0 0.1							0 0.5					
	Motor	0 0.1	0 0.4						0 0.3	0 8.0	F 8.0			
06	MOTOR ASSY													
	Motor	0 0.1	0 0.4						0 0.3	0 8.0	F 8.0			
	Bearing								F 0.5					
	Rotor and Shaft								F 0.5	F 2.0				
	Overload Temperature	0 0.1	0 0.2						F 0.3					
07	HEATER ASSY													
	Element	0 0.1	0 0.2						0 1.0					
08	WIRING HARNESS, CAPACITOR, CLAMPS AND RELAY													
	Wiring Harness	0 0.2							0 1.0	0 0.3				
	Relay	0 0.1	0 0.2						0 0.4					
	Capacitor	0 0.1	0 0.2						0 0.3					
09	REFRIGERATION PIPING													
	Tube	0 0.1	0 0.2						F 4.0	F 4.0				
	Valves	0 0.1	0 0.1						F 1.0					
	Dehydrator	(							F 4.0					
	Coils	(1	0 0.2	0 1.0					F 4.0	F 5.0				
	Sight Glass	) (1							F 4.0					
10	PRESSURE SWITCHES, VALVES AND PIPING													
	Valves, Charging		0 0.1		F 1.0				F 4.0					
	Solenoid Valve	0 0 1	0 0.1						F 4.0					

Section II. MAINTENANCE ALLOCATION CHART—Continued

(1) Group No.	(2) Assembly group	(3) Maintenance Functions A Inspect	B Test	C Service	D Adjust	E Aline	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild	(4) Tools and equipment	(5) Remarks
11	HIGH AND LOW PRESSURE SWITCHES AND ENCLOSURE													
	Switches		0						F					
			0.1						4 0					
12	COMPRESSOR ASSY.													
	Compressor	0	0	F					H					
		0.1	0.2	4.0					16.0					
	Strainer	0							F					
		0.1							4 0					
13	ACCESSORY ITEMS													
	Canvas Cover	0							0	0				
		0.1							0.2	0.5				
	Sound Attenuator	0							0					
		0.1							0.5					

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:
VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-25C (qty rqr block No. 529), operator maintenance requirements for Environmental Equipment, Air Conditioners 6,000 BTU.

TM 5-4120-336-14
C 2

CHANGE NO. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *22 April 1975*

Operator, Organizational, Direct Support and General Support Maintenance Manual

AIR CONDITIONER, VERTICAL: COMPACT, SELF-CONTAINED, AIR COOLED, ELECTRIC MOTOR DRIVEN 115 VOLTS, A. C., 50/60 HERTZ, SINGLE PHASE 6,000 BTU/HR COOLING, 4,500 BTU/HR HEATING (HARVEY W. HOTTEL MODEL CV-6-5/6-15) NSN 4120-00-935-1608

TM 5-4120-336-14, 30 November 1973, is changed as follows:

The title is changed as shown above.

Page 1-1. Paragraph 1-2*b* is superseded as follows:

b. Reporting of Errors. You can improve this manual by recommending improvements using DA Form 2028 (Recommended Changes to Publications and Blank Forms) and/or Da Form 2028-2 (Recommended Changes to Equipment Technical Manuals) located in the back of the manual. Mail the forms direct to Commander, US Army Troop Support Command, ATTN: AMSTS-MPP, 4300 Goodfellow Blvd., St. Louis, MO 63120. A reply will be furnished direct to you.

Page 2-3. Paragraph 2-3*a* is superseded as follows:

a. General. The air conditioner unit must be installed in a tilted position not more than a two degree angle toward the useable condensate drain connection for proper condensate drainage. There are four alternate drain connections located in the base of the unit. (See fig. 1-1 and 1-2). Use as many of the drain connections as possible. The two side drain connections provide the best drainage. The back drain offers the poorest drainage of the four connections and should be used as a single drain only if the other connections are not accessible in the units installed position.

Paragraph 2-3*b*, line 1. "The front access panel" is changed to read "The sound attenuator, front access panel".

Paragraph 2-3c is superseded as follows:

c. Installing Unit.

(1) Refer to base plan (fig. 1-4) for dimensions. The two threaded holes centered two inches from the left side view of the base plan represent the front mounting holes of the unit.

(2) Install the unit on the floor or other flat surface capable of supporting a concentrated weight of more than 180 pounds (81kg).

(3) Bolt the unit to the mounting surface in the desired tilted position by utilizing the four threaded holes in the base of the unit.

(4) Support the unit at the top by utilizing the mounting receptacle shown in figure 1-2.

(5) Remove drain plugs from the selected drain connections and install ⅜ inch flare by ½ inch male pipe thread half union elbows.

(6) Connect drain tubing not less than 4 feet long and not greater than 5/16 inch I.D. to drain connections. If plastic tubing is utilized, a short ⅜ inch O.D. stub tube can be attached to each elbow for installation of tubing.

(7) Periodic cleaning of the tubing will be required. Use of clear plastic tubing is preferred for the purpose of observing flow of condensate water or the early detection of a clogging condition.

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

SOMETHING WRONG WITH THIS MANUAL?

THEN. . .JOT DOWN THE DOPE ABOUT IT ON THIS FORM, TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

FROM: (YOUR UNIT'S COMPLETE ADDRESS)
PFC JOHN DOE
CoA, 3d ENGINEER BN
FT. LEONARD WOOD MO 63108

DATE 16 DEC 74

PUBLICATION NUMBER	DATE	TITLE
TM5-6115-200-20 AND P	1 APR 72	GENERATOR SET 10 KW NSN 6115-00-231-7286

BE EXACT. . .PIN-POINT WHERE IT IS				IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.	
6	2-1 a			In line 6 of paragraph 2-1a the manual states the engine has 6 cylinders. The engine on my set only has 4 cylinders. Change the manual to show 4 cylinders
81		4-3		Callout #6 on figure 4-3 is pointing at a bolt. In the key to fig. 4-3, item 16 is called a shim. Please correct one or the other.
125	line 20			I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3701. I got a gasket but it doesn't fit. Supply says I got what I ordered so the NSN is wrong. Please give me a good NSN

SAMPLE

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
JOHN DOE, PFC (268) 317-7111

SIGN HERE: John Doe

DA FORM 1 AUG 74 2028-2 (TEST)

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR MANUAL "FIND," MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

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U.S. Army Troop Support Command
ATTN: AMSTS-MPP
4300 Goodfellow Boulevard
St. Louis, Missouri 63120

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

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PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.

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4300 Goodfellow Boulevard
St. Louis, Missouri 63120

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

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DATE

PUBLICATION NUMBER	DATE	TITLE

BE EXACT. . .PIN-POINT WHERE IT IS				IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.	

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER	SIGN HERE:

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4300 Goodfellow Boulevard
St. Louis, Missouri 63120

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

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DATE

PUBLICATION NUMBER	DATE	TITLE

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER	SIGN HERE:

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U.S. Army Troop Support Command
ATTN: AMSTS-MPP
4300 Goodfellow Boulevard
St. Louis, Missouri 63120

TEAR ALONG DOTTED LINE

FOLD BACK

REVERSE OF DA FORM 2028-2 (TEST)

By Order of the Secretary of the Army:

FRED C. WEYAND
General, United States Army
Chief of Staff

Official:
VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-25C (qty rqr block No. 529), Operator requirements for Environmental Equipment; Air Conditioners, 6,000 BTU.

TM 5-4120-336-14
C3

CHANGE

NO. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D C, *16 November 1977*

Operator, Organizational, Direct Support and General Support Maintenance Manual

AIR CONDITIONER, VERTICAL: COMPACT, SELF-CONTAINED, AIR COOLED, ELECTRIC MOTOR DRIVEN 115 VOLTS, A. C. 50/60 HERTZ, SINGLE PHASE 6,000 BTU/HR COOLING, 4,500 BTU/HR HEATING (HARVEY W. HOTTEL MODEL CV-6-5/6-15)

NSN 4120-00-935-1608

TM 5-4120-336-14, 30 November 1973, is changed as follows:

Back of Cover Page. Add the following:

WARNING

Before removing any components from the refrigerant fluid system, the Refrigerant 22 must be discharged.

Page 1-1. Paragraph 1-1*a.* is superseded as follows:

a. This manual is published for use of personnel to whom Harvey W. Hottel Models CV-6-5/6-15 (serial numbers 100 to 399) and CV-6-5/6-15 (serial numbers 400 and up) air conditioners are issued. Chapters 2 and 3 provide information on operation and operator services. Chapter 4 provides information on organizational maintenance. Chapter 5 contains direct and general support maintenance instructions and Chapter 6 provides instructions for repair of the air conditioner.

Page 1-1. Paragraph 1-2*b.*is superseded as follows:

b. You can help improve this manual. If you find any mistake or if you know of a way to improve the procedure, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publication and Blank Forms), or DA Form 2028-2 located in the back of this manual directly to: Commander, US Army Troop Support and Aviation Materiel Readiness Command, ATTN: DRSTS-MTPS, 4300 Goodfellow Blvd., St. Louis, MO 63120. A reply will be furnished to you.

Page 1-1. Add Paragraph 1-3 as follows:

1-3. Differences Between Models. Refer to paragraph 1-4 *b.* for differences between models.

Page 1-3. After Figure 1-2 add the following:

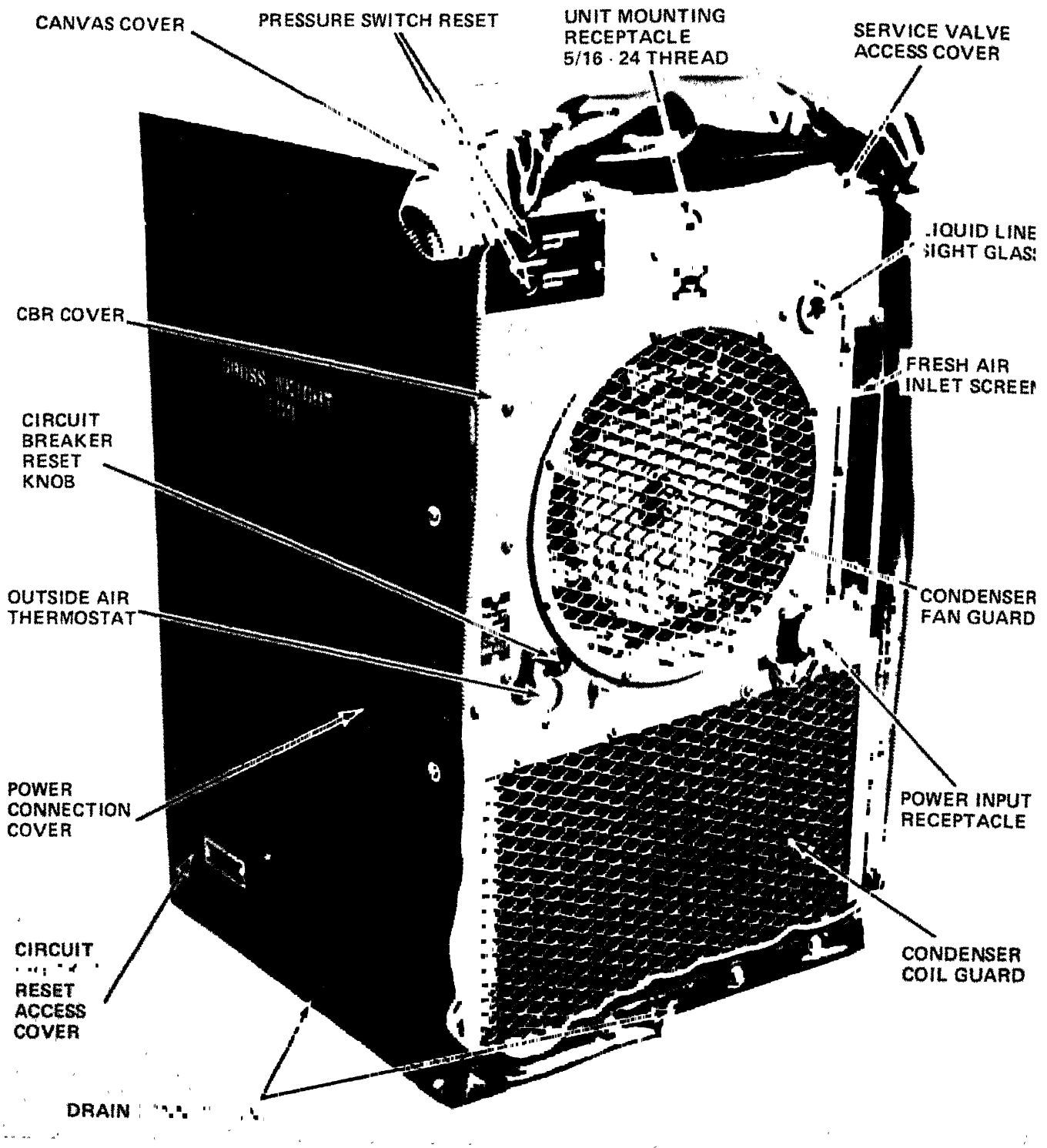

Figure 1-2.1 Air Conditioner (Serial Numbers 400 and up), Right Back

Page 1-5. Change paragraph 1-4*b.*(1) eighth line as follows:

Stock Number 4120-00-935-7608

Page 1-5. Change paragraph 1-4*b.*(5) second line as follows:

Type ..... Condenser-propeller

Page 1-6. Add paragraph 1-4*b.*(12.1) as follows:

(12.1) Circuit breaker (serial numbers 400 and up).

Manufacturer ..... Heinemann Electric Co.
Hold amperes 15
Trip amperes 17.3
Type ..... Manual reset
Auxiliary switch ..... Single pole-double throw
Phase 1
Frequency ..... 50/60 Hertz

Page 1-6. Add paragraph 1-4*b.* as follows:

(13.1) Transformer, control voltage 9 serial numbers 400 and up).

Manufacturer ..... Milwaukee Transformer Co.
Primary volts 115
Frequency ..... 50/60 Hertz
Secondary volts 30
Ampere output 1.9
Primary connections ..... H-1 and H-2
Secondary connections ..... X-1 and X-2

Page 1-6. Add Paragraph 1-4*b.*(16.1) as follows:

(16.1) Capacitor (serial numbers 400 and up.

Manufacturer ..... Cornell Dubilier Electronics
Part number ..... KBL 37F106Q
Voltage ..... 370 volts AC
Capacitance ..... 20 MF
Frequency ..... 50/60 Hertz

Page 1-6. Add paragraph 1-4*b.*(19.1) as follows:

(19.1) Fan speed relay (serial numbers 400 and up).

Manufacturer ..... Potter and Brumfield
Part number ..... PM 4000
Coil voltage ..... 28 volts DC
Contact type ..... 4-pole-double throw
Contact rated load ..... 8.5 amps

Page 1-6. Add paragraph 1-4*b.*(21.1) as follows:

(21.1) Thermostat, outside air (serial numbers 400 and up).

Manufacturer ..... Stevens Mfg Co.
Part number NTP-25
Contact type ..... Single pole-double throw
Control point ..... 50 F
contact action ..... Open on temperature decrease

Page 1-6. Add paragraph 1-4*b.*(24-1) as follows:

(24.1) Compressor (serial numbers 400 and up).

Manufacturer ..... Welco Industries
Model MIL-J-6VBC-610
Type ..... Rotary vane
Lubrication ..... Forced feed
RPM 3390
Phase ..... Single
Frequency ..... 50/60 Hertz
Voltage 115
Full load current ..... 12 amps
Locked rotor current ..... 49 amps
Oil charge 30

Page 1-7. Add paragraph 1-4*b.* as follows:

(35.1) Discharge service valve (serial numbers 400 and up).

Manufacturer ..... Robinair Manufacturing Corporation
Part number V2A-4
Connection size ..... 1/4 id, 3/8 od

Page 1-7. Add paragraph 1-4*b.* as follows:

(35.1) Discharge service valve (serial numbers (400 and up).

Manufacture ..... Robinair Manufacturing Corporation
Part number V2A-4
Connection size ..... 1/4 id, 3/8 od

Page 1-8. Paragraph 1-5 is superseded as follows:

1-5. Difference in Models

This manual covers Harvey W. Hottel CV-6-5/6-15 Air Conditioner, Serial Nos. 100 through 399 and Serial Nos. 400 and up. Refer to paragraph 1-4 for the difference in the models covered by this manual.

Page 2-7. After Figure 2-3 add the following:

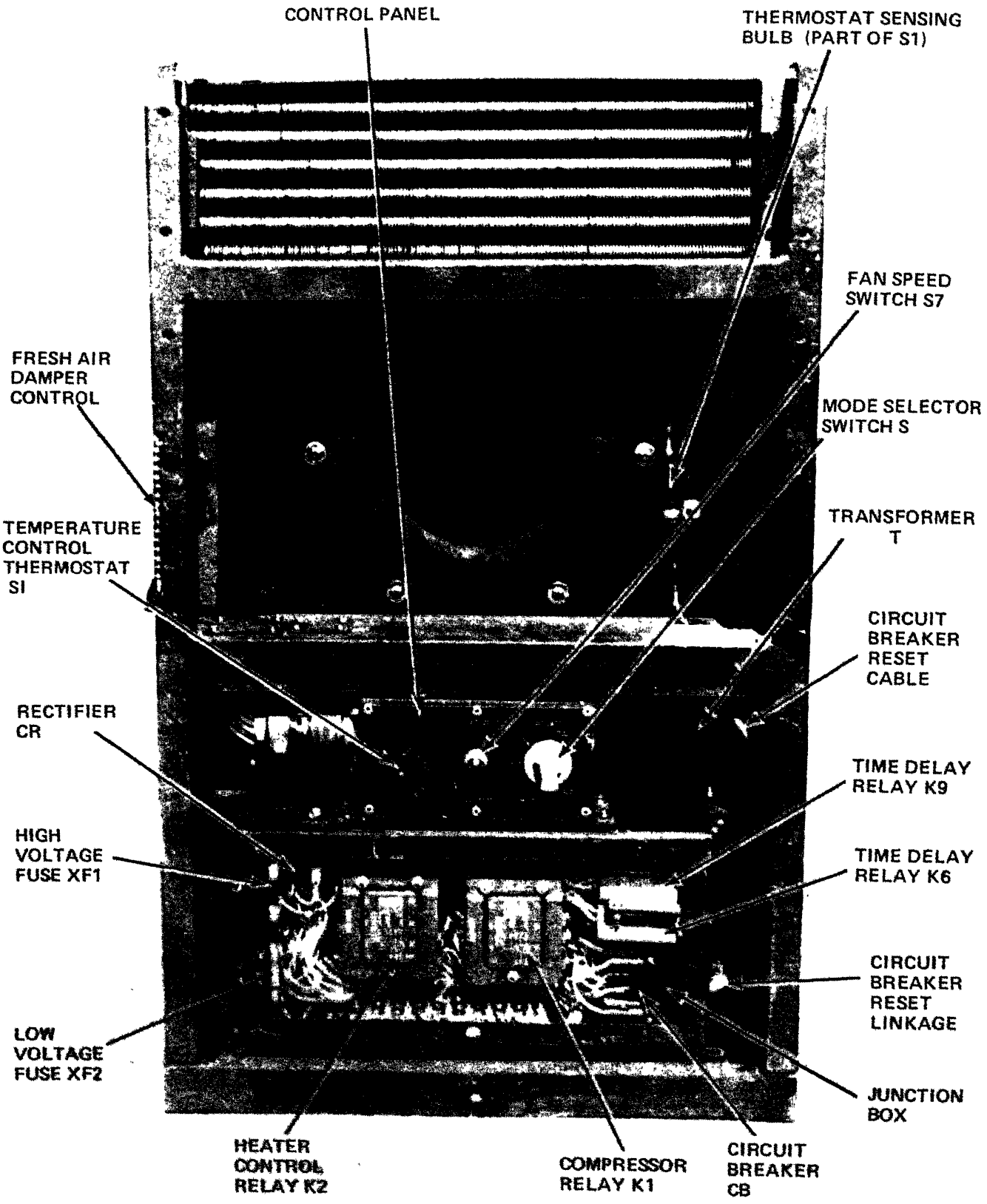

Figure 2-3.1. Controls and Instruments (Front of Unit) (Serial numbers 400 and up)

Page 2-8. After Figure 2-4 add the following:

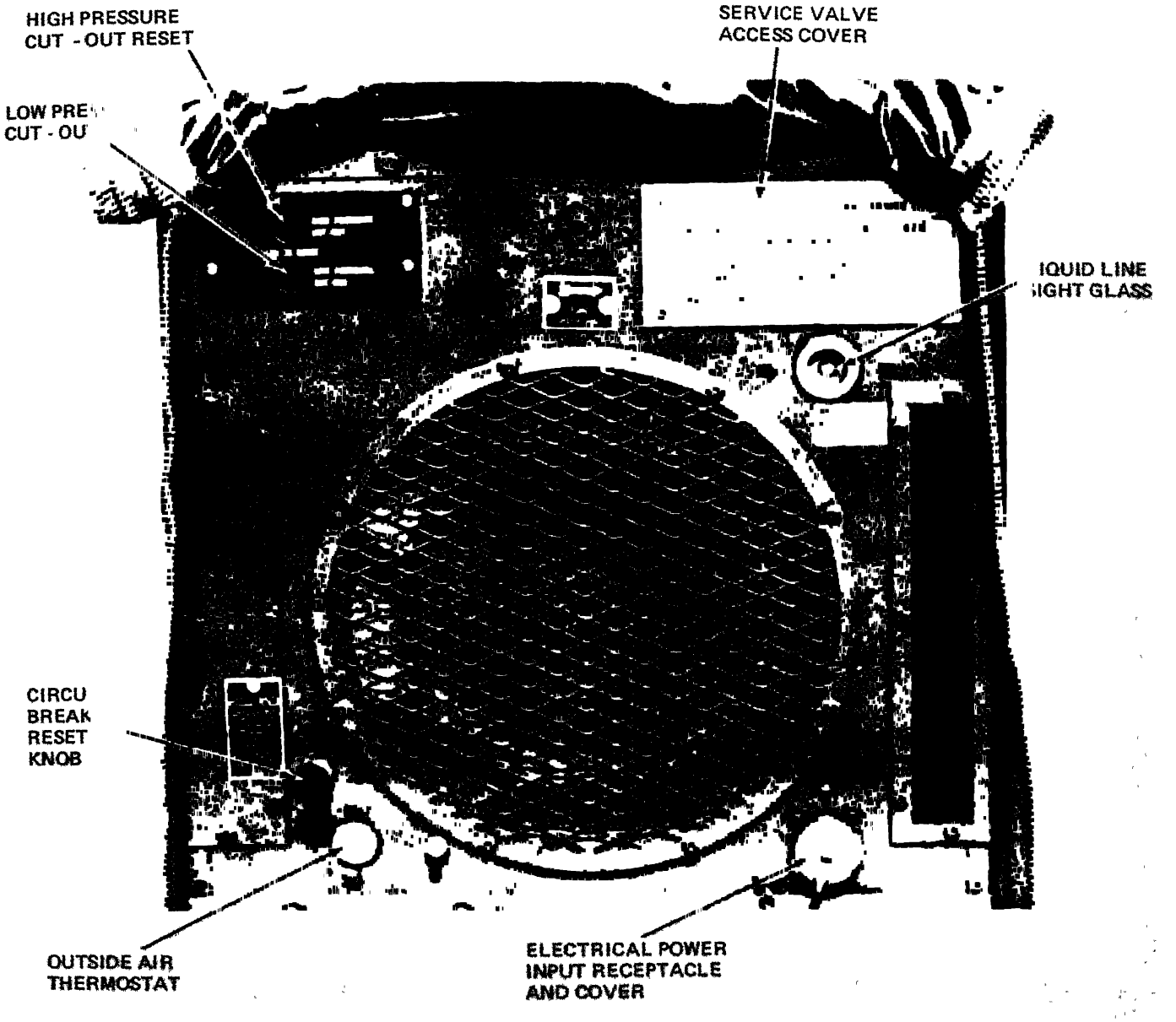

Figure 2-4.1. Controls and Instruments (Back of Unit) (Serial numbers 400 and up)

Page 2-9. After Figure 2-5 add the following:

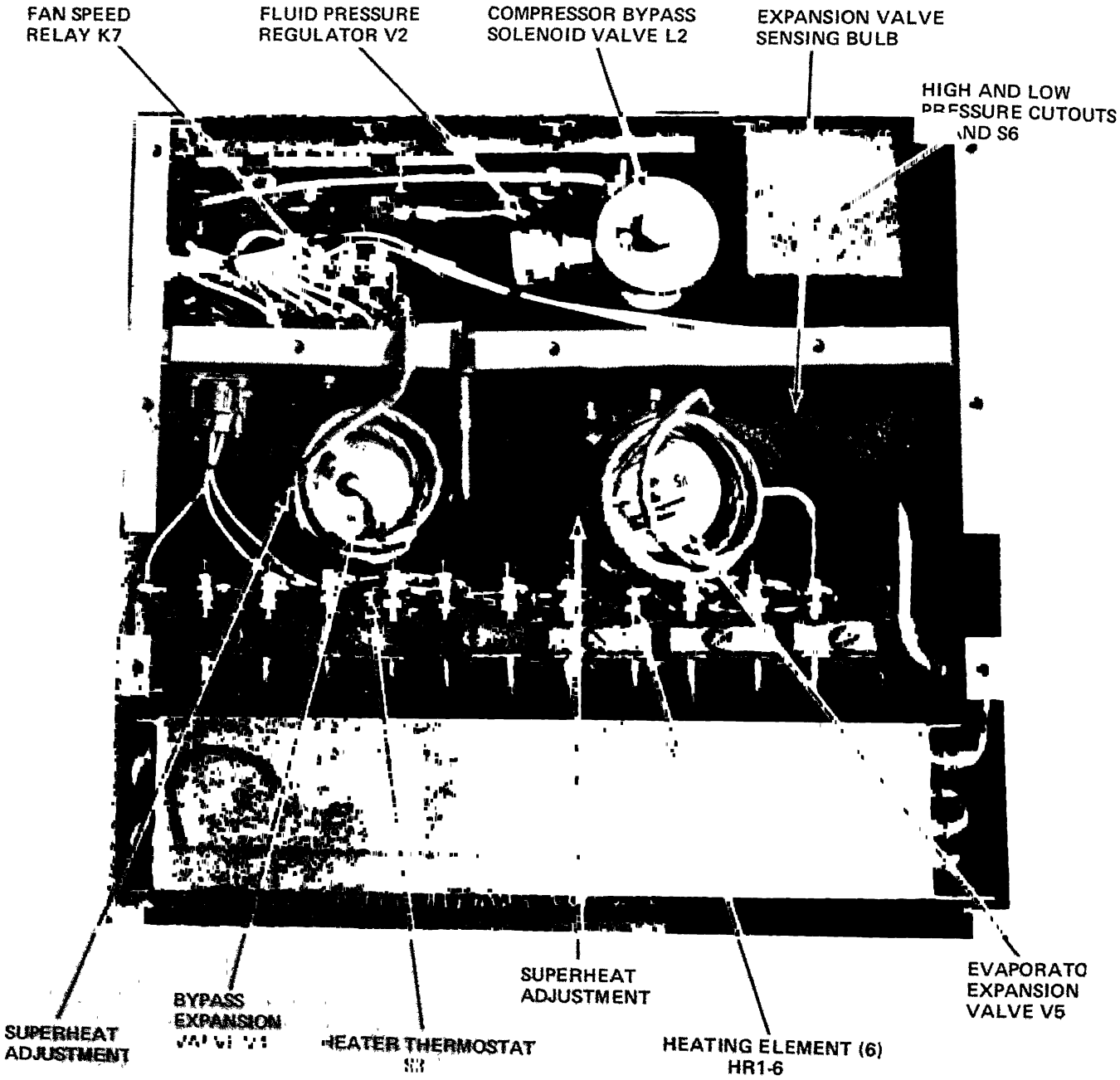

Figure 2-5.1. Controls and instruments (Top of Unit) (Serial numbers 400 and up)

Page 4-11. After figure 4-1, add the following:

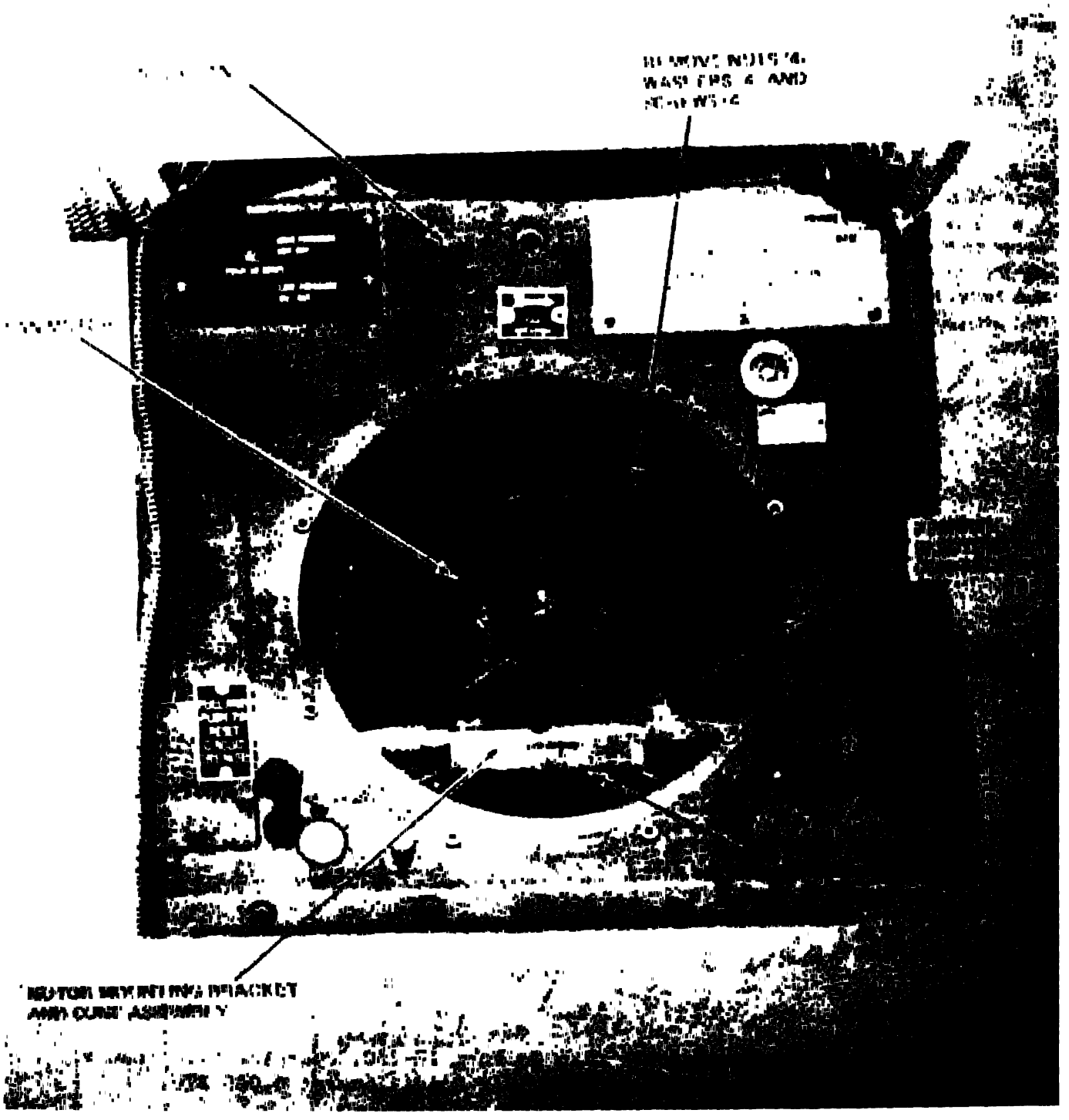

Figure 4-1.1. Fan Motor, removal and installation (Serial numbers 400 and up)

Page 4-5. Paragraph 4-10 is superseded as follows:

4-10. General

Refer to figures 1-1 and 1-2 for the location of panels, covers, screens, guards and grilles.

Page 4-6. Paragraph 4-15 is superseded as follows:

4-15.1 Service Valve Access Cover (serial numbers 400 and up).

a. General. The service valve access cover must be removed for access to the suction and discharge service valves. The cover must be removed to provide access for installation of charging and pressure test gauges to the suction and discharge service valves.

b. Removal. Remove the service valve access cover by removing six screws which secure the cover to the rear of the casing.

c. Servicing. Servicing of the service valve access cover consists of re-gluing or replacement of loose or defective gasketing.

d. Installation. Installation of the service valve access cover shall be in reverse order of removal.

Page 4-9. Change paragraph 4-30d. line six by deleting the third word in sentence. Sentence will now read as follows:

Pressure should be applied only to the hub of the wheel during installation to prevent distortion of the cone and blades.

By Order of the Secretary of the Army:

BERNARD W. ROGERS
General, United States Army
Chief of Staff

Official:
J. C. PENNINGTON
Brigadier General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-25C, Operator maintenance requirements for Environmental Equipment, Air Conditioners: 6,000 BTU.

SOMETHING WRONG WITH THIS MANUAL?

THEN. . .JOT DOWN THE DOPE ABOUT IT ON THIS FORM, TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

FROM: (YOUR UNIT'S COMPLETE ADDRESS)
PFC JOHN DOE
CoA, 3d ENGINEER BN
FT. LEONARD WOOD MO 63108

DATE 16 DEC 74

PUBLICATION NUMBER	DATE	TITLE
TM5-6115-200-20 AND P	1 APR 72	GENERATOR SET 10 KW NSN 6115-00-231-7286

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.
6	2-1 a		
81		4-3	
125	line 20		

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

In line 6 of paragraph 2-1a the manual states the engine has 6 cylinders. The engine on my set only has 4 cylinders. Change the manual to show 4 cylinders

Callout 16 on figure 4-3 is pointing at a bolt. In the key to fig. 4-3, item 16 is called a shim. Please correct one or the other.

I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit supply says I got what I ordered so the NSN is wrong. Please give me a good NSN

SAMPLE

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
JOHN DOE, PFC (268) 317-7111

SIGN HERE: John Doe

DA FORM 1 AUG 74 2028-2 (TEST)

P.S.—IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR MANUAL "FIND," MA A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

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US Army Troop Support & Aviation
Materiel Readiness Command
ATTN: DRSTS-MTPS
4300 Goodfellow Blvd
St. Louis, MO 63120

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SOMETHING WRONG WITH THIS MANUAL?

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FROM: (YOUR UNIT'S COMPLETE ADDRESS)

DATE

PUBLICATION NUMBER	DATE	TITLE
TM 5-4120-336-14	30 NOV 73	AIR CONDITIONER, VERTICAL NSN 4120-00-935-1608

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

SIGN HERE:

DA FORM 2028-2

TEAR ALONG DOTTED LINE

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4300 Goodfellow Blvd
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CHANGE NO. 4

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Operator, Organizational, Direct Support and General Support Maintenance Manual

AIR CONDITIONER, VERTICAL; COMPACT, SELF-CONTAINED, AIR COOLED, ELECTRIC MOTOR DRIVEN 115 VOLTS, A. C., 50/60 HERTZ, SINGLE PHASE 6,000 BTU/HR COOLING, 4,500 BTU/HR HEATING (HARVEY W. HOTTEL MODEL CV-6-5/6-15) NSN 4120-00-935-1608

TM 5-4120-336-14, 30 November 1973, is changed as follows:

Page iii, List of Illustrations. After figure 1-5, add: "Figure 1-5.1. Wiring Diagram (With Compressor Crankcase Heater, HR 7) (Located in back of manual)".

After Figure 1-5 (located in back of manual), insert Figure 1-5.1 (located in back of manual).

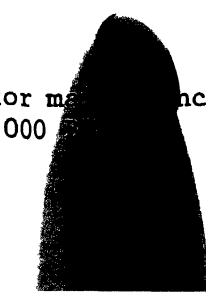
By Order of the Secretary of the Army:

BERNARD W. ROGERS
General, United States Army
Chief of Staff

Official:

J. C. PENNINGTON
Brigadier General, United States Army
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12-25C, Operator m[illegible]nce requirements for Environmental Equipment: Air Conditioners, 6,000



CHANGE NO. 5

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 26 March 1987

Operator, Organizational, Direct Support,
and General Support Maintenance Manual

AIR CONDITIONER, VERTICAL: COMPACT,
SELF-CONTAINED, AIR COOLED,
ELECTRIC MOTOR DRIVEN
115 VOLTS, A.C. 50/60 HERTZ, SINGLE PHASE
6,000 BTU/HR COOLING, 4,500 BTU/HR HEATING
(HARVEY W. HOTTEL MODEL CV-6-5/6-15)
NSN 4120-01-172-8841

TM 5-4120-336-14, 30 November 1973, is changed as follows:

The title is changed as shown above.

Throughout manual change all references to Model CV-6-5/6-15, NSN 4120-00-935-1608 to read Model CY6-5/6-15, NSN 4120-01-172-8841.

By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

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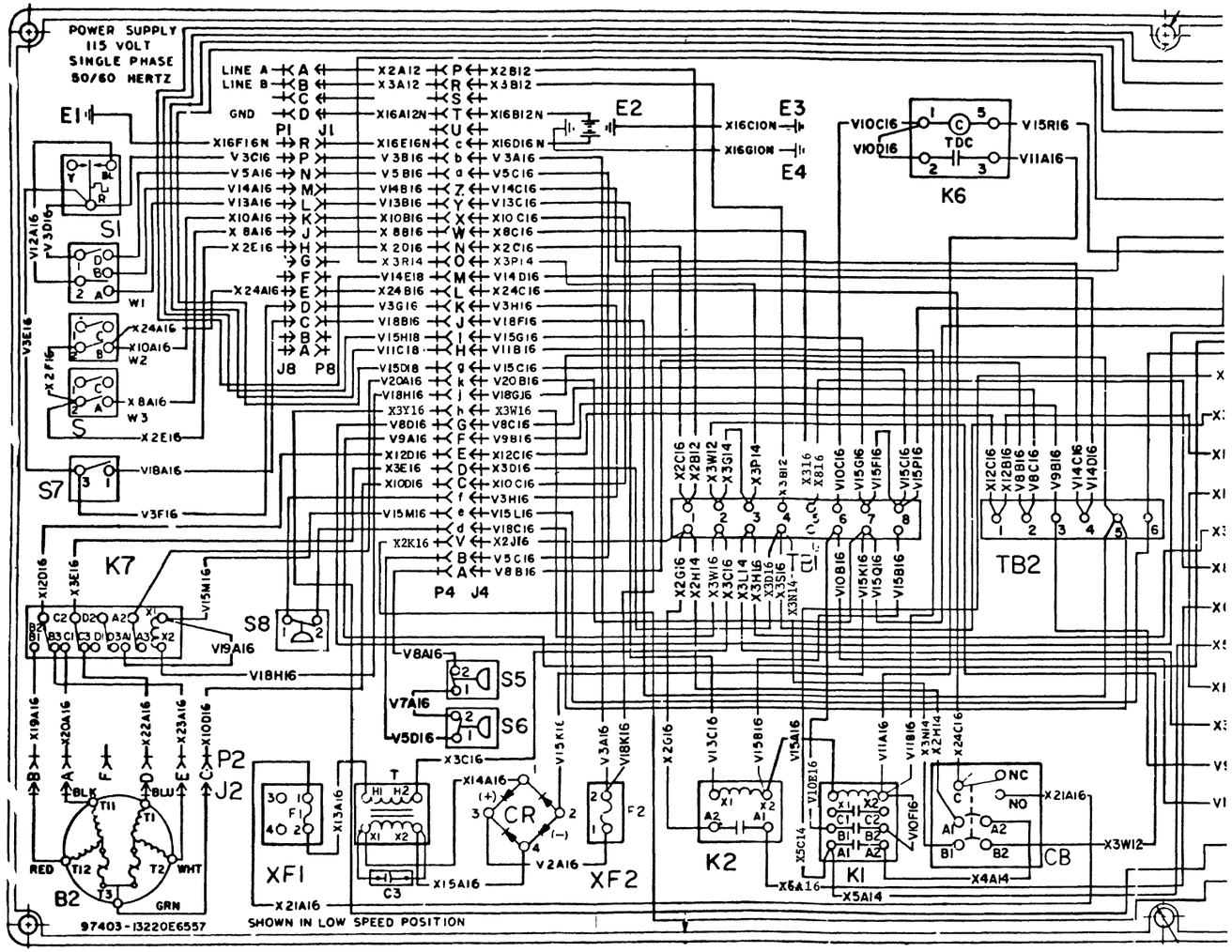
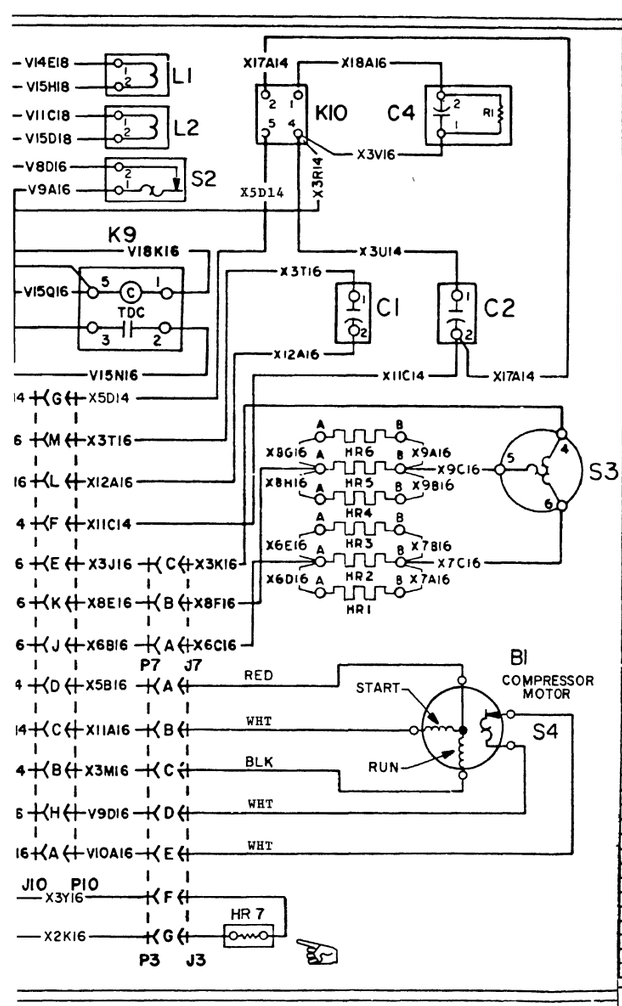
To be distributed in accordance with DA Form 12-25A, Operator, Organizational, Direct Support, and General Support Maintenance requirements for Air Conditioner, Vertical Compact, Self-Contained, 600 BTU Cool/4500 BTU Heat, 115V, AC, 50/60HZ, 1PH (CV-6-5/6-15)





SWITCH POSITION						
	CONTACT NO.	1 HI HEAT	2 LO HEAT	3 OFF	4 VENT	5 COOL
S/W1	2 & A	CLOSED	CLOSED	OPEN	OPEN	OPEN
	2 & B	OPEN	OPEN	OPEN	OPEN	CLOSED
	1 & D	OPEN	OPEN	OPEN	OPEN	CLOSED
S/W2	2 & B	CLOSED	CLOSED	OPEN	CLOSED	CLOSED
S/W3	2 & A	CLOSED	OPEN	OPEN	OPEN	OPEN

LEGEND		
SYMBOL	PART NO.	DESCRIPTION
B1	13214E3538-1	MOTOR COMPRESSOR
B2	13214E3728-1	MOTOR, ALTERNATING CURRENT, FAN
C1	13214E3529-1	CAPACITOR, FAN MOTOR
C2	13214E3529-2	CAPACITOR, COMPRESSOR, MOTOR RUN
C3	13219E9891	CAPACITOR ASSEMBLY
C4	13220E8228-2	CAPACITOR, COMPRESSOR, MOTOR START
C5	13216E6206-4	CIRCUIT BREAKER
CR	13214E3652	RECTIFIER, SEMICONDUCTOR DEVICE
E1	MS 35207-267	GROUND, CONTROL PANEL
E2	MS 35207-267	GROUND, JUNCTION BOX
E3	MS 90726-5	GROUND, FRAME
E4	MS35207-267	GROUND, EXTERNAL
F1	MIL-F-15160	FUSE (TYPE F09A250V3A)
F2	13211E3785	FUSE
HPI-6	13214E3561	HEATING ELEMENT
HR7	P/O 13214E3538-1	CRANKCASE HEATER, COMPRESSOR
J1	MS 3100R-20-4PX	CONNECTOR RECEPTACLE
J2	MS 3120P-14S-6P	CONNECTOR RECEPTACLE
J3	MS 3102R-16S-1P	CONNECTOR RECEPTACLE
J4	MS 3102R-32-7P	CONNECTOR RECEPTACLE
J7	MS 3100R-16-10P	CONNECTOR RECEPTACLE
J8	13211E8399028-17P	CONNECTOR RECEPTACLE
J10	MS 3102R-28-9S	CONNECTOR RECEPTACLE
K1	MS 24192-D1	RELAY, COMPRESSOR
K2	MS 24192-D1	RELAY, 25 AMP, 3 PCT N.O.
K6	13216E6182-3	RELAY, TIME DELAY, COMPRESSOR
K7	13215E9921	RELAY, FAN
K9	13216E182-2	RELAY, TIME DELAY, FAN MOTOR
K10	13216E6240	RELAY ARMATURE
L1	13214E3524	VALVE, SOLENOID, LIQUID LINE
L2	13214E3524	VALVE,SOLENOID,PRESSURE EQUALIZER
P1	MS 3106R-20-SX	CONNECTOR PLUG
P2	MS 3106F-14S-6S	CONNECTOR PLUG
P3	MS 3106R-16S-1S	CONNECTOR PLUG
P4	MS 3106R-32-7S	CONNECTOR PLUG
P7	MS 3106R-16-10S	CONNECTOR PLUG
P8	MS 3100R-28-17S	CONNECTOR RECEPTACLE
P10	MS 3106R-28-9P	CONNECTOR PLUG
R1	P/O 13220E8228-2	RESISTOR, CAPACITOR BLEEDER
S	13211E8298	SWITCH, ROTAR
S1	13211E8301-1	THERMOSAT,TEMPERATURE CONTROL
S2	13211E8180	THERMOSTAT, AMBIENT AIR TEMPERATURE
S3	13211E8265	THERMOSTAT HEATER
S4	P/O13214E3538-1	THERMOSTAT COMPRESSOR
S5	13211E8404	SWITCH, HIGH PRESSURE CUTOUT
S6	13214E3794	SWITCH, LOW PRESSURE CUTOUT
S7	MS 24523-22	SWITCH, TOGGLE, FAN, HI-LO SPEED
S8	13216E7690-2	SWITCH, PRESSURE CONTROL
T	13214E818-2	TRANSFORMER
TB1	MIL-T-55164/3	TERMINAL BOARD
TB2	13214E3804	TERMINAL BOARD
XF1	13211E3784	FUSEHOLDER,POWER INPUT, AC
XF2	13214E3811	FUSEHOLDER,CON. VOLTAGE,DC

Figure 1-5.1. Wiring Diagram (With Compressor Crankcase Heater, HR 7)

TECHNICAL MANUAL
NO. 5-4120-336-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *30 November 1973*

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

AIR CONDITIONER, VERTICAL: COMPACT, SELF-CONTAINED, AIR COOLED, ELECTRIC MOTOR DRIVEN 115 VOLTS, A.C. 50/60 HERTZ, SINGLE PHASE 6,000 BTU/HR COOLING, 4,500 BTU/HR HEATING (HARVEY W. HOTTEL MODEL CV-6-5/6-15)

FSN 4120-455-7673

LIST OF ILLUSTRATIONS

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1 Scope

a. This manual is published for use of personnel to whom Harvey W. Hottel Model CV-6-5 / 6-15 air conditioners are issued. Chapters 2 and 3 provide information on operation and operator services. Chapter 4 provides information on organizational maintenance. Chapter 5 contains direct and general support maintenance instructions and Chapter 6 presents instructions for repair of the air conditioner.

b. Report all equipment improvement recommendations as prescribed by TM 38-750.

c. Instructions pertaining to storage of the air conditioner can be found in TM 740-90-1.

d. Instructions pertaining to destruction of the air conditioner to prevent enemy use can be found in TM 750-244-3.

1-2. Forms and Records

a. Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750.

b. Report of errors, omissions and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 20208, (Recommended Changes to DA Publications) and forwarded directly to Commander, U.S. Army Troop Support Command, ATTN: AMSTS-MP, 4300 Goodfellow Boulevard, St. Louis, Missouri 63120.

Section II. DESCRIPTION AND DATA

1-3. Description

a. General. The air conditioner (fig. 1-1) is used primarily in van type enclosures for providing filtered, conditioned, or heated air as required to maintain service conditions necessary for the efficient operation of electronic equipment and for the comfort of operating personnel housed within the vans. It is a completely self-contained, air cooled, electric motor driven unit designed for continuous operation with varying loads. It is equipped with internal ducting to the low side of the evaporator fan so that ventilation air from a chemical and biological filter may be supplied by the evaporator fan.

b. Condensing Section. The condensing section, located at the bottom and rear of the unit, contains the hermetically sealed compressor, condenser coil, condenser air intake opening, condenser air discharge opening, control panel, junction box, capacitors, temperature control thermostat, sight glass, power receptacle connector, condenser fan, fan motor, dehydrator, suction and discharge service valves, and solenoid valves.

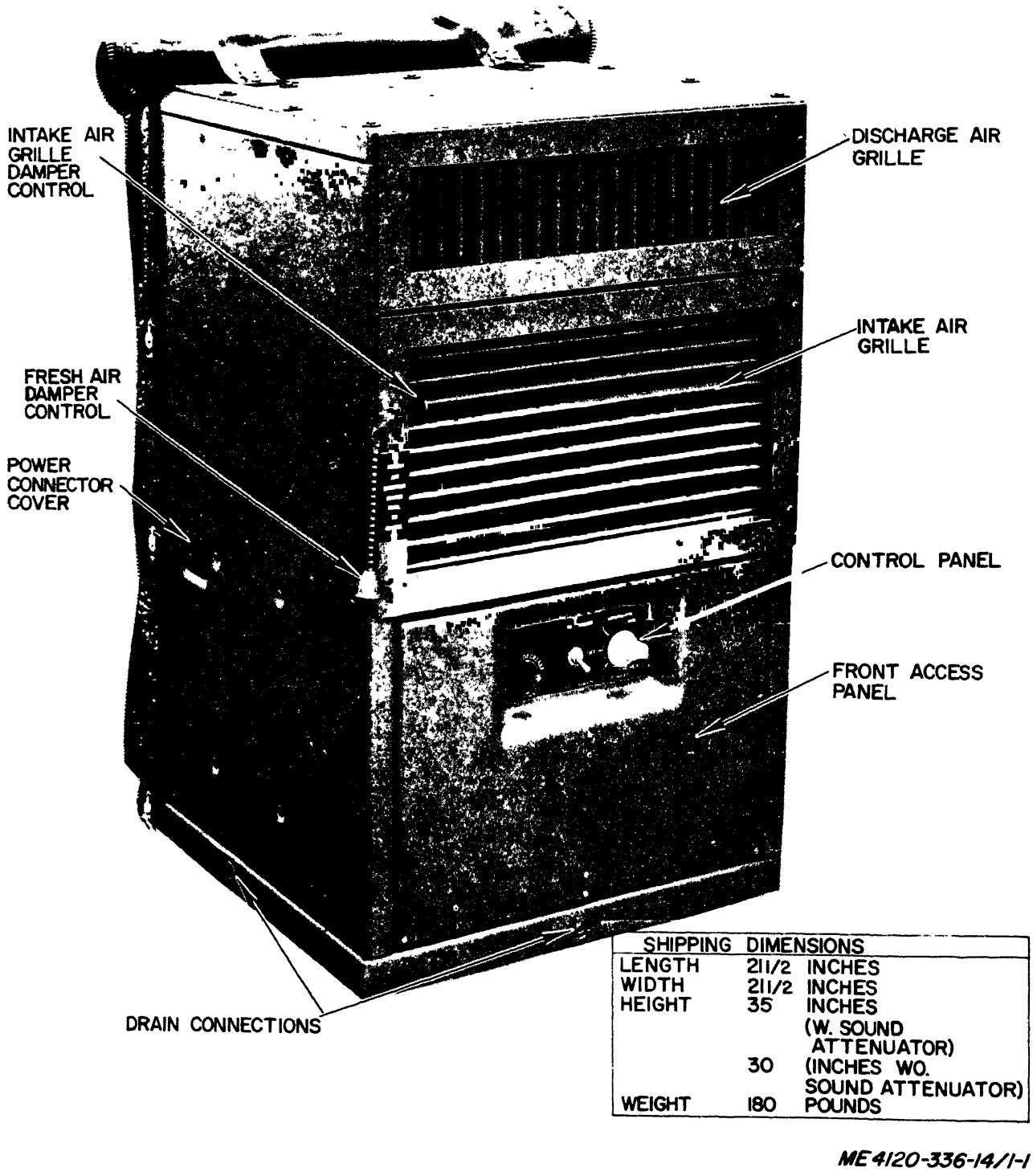


Figure 1-1. Air conditioner, left front with shipping dimensions.

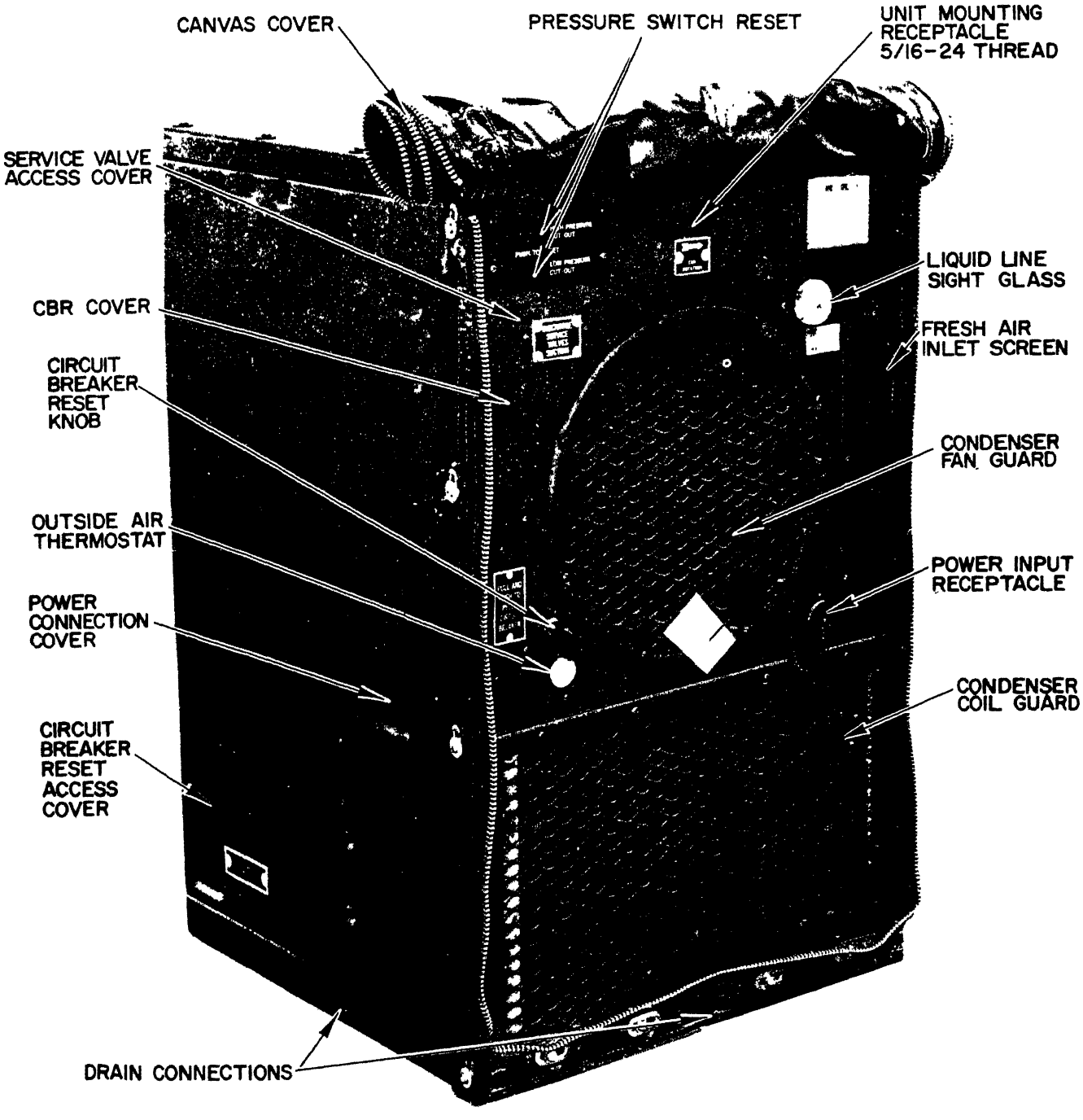


Figure 1-2. Air conditioner, right back.

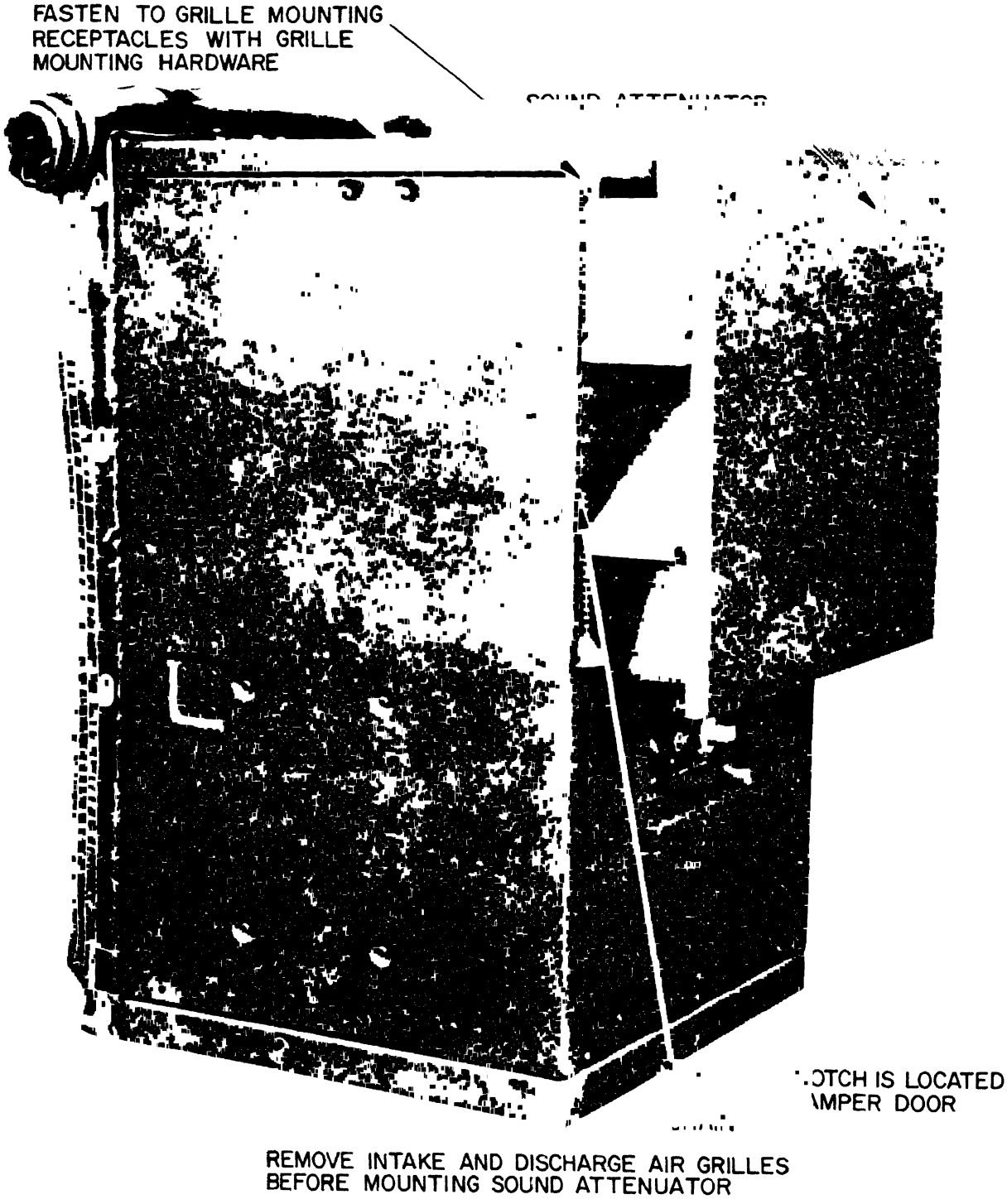


Figure 1-3. Air conditioner, sound attenuator installation.

c. *Evaporator Section.* The evaporator section, located in the top and front of the unit, contains an evaporator coil, evaporator fan, air conditioning filter, intake and discharge air grilles, condensate drain pan, expansion valves, electric heaters, and a damper to regulate the amount of outdoor air entering the air conditioner.

1-4. Identification and Tabulated Data

a. Identification. The air conditioners have fourteen major identification and instruction plates. Information contained on these plates is listed below:

(1) *Air conditioner identification plate.* Located on the top panel. Specifies nomenclature, military model number, federal stock number, serial number, specification number, part number, contract number, date, weight and capacity.

(2) *Compressor identification plate.* Located on the front of compressor housing. Specifies compressor model number, part number, serial number, refrigerant, oil type and capacity, manufacturer and complete electrical data.

(3) *Fan motor identification.* Located on top of the fan motor. Specifies motor horsepower, serial number, rpm (revolutions per minute), and electrical characteristics.

(4) *Control panel legend plate.* Located on the front of the unit control panel. Indicates unit temperature setting for cooling or heating purposes, mode selector switch and fan speed switch.

(5) *Wiring diagram plate.* Located on inside of front access panel, illustrates complete unit wiring.

(6) *Refrigerant 22 plate.* Located on the rear panel in upper right area. It states that the unit is charged with 2.44 pounds of Refrigerant 22.

(7) *Color indicating plate.* Located on the rear panel immediately below the liquid line sight glass. It has three color bands: green, chartreuse, and yellow which are used in conjunction with the liquid sight line glass to indicate moisture condition of the refrigerant.

(8) *High and low pressure cutout control reset plate.* Located on rear panel at the high and low pressure cutout control reset buttons with nomenclature: "PUSH TO RESET".

(9) *Indicating arrow plate.* Located on the rear panel just above the condenser fan guard; the arrow indicates direction of condenser fan rotation.

(10) *Compressor circuit breaker reset plate.* Located on the lower right side of the air conditioner. It states: "CIRCUIT BREAKER RESET".

(11) *Refrigerant piping plate.* Located on outside of front access panel.

(12) *Service gage plate.* Located beside the CBR cover on the rear panel. It states: "DISCHARGE, SERVICE VALVES, SUCTION".

(13) *Compressor circuit breaker reset plate.* Located on the back of the unit on the CBR duct cover. It states: "PULL AND PUSH TO RESET CIRCUIT BREAKER".

(14) *Damper operation plate.* Located on return air grille on front of air conditioner. It states: "FRESH AIR DAMPER CHAIN PULL TO CLOSE".

b. Tabulated Data.

(1) *Air conditioner identification plate.*

Air conditioner	Vertical. compact. Harvey W. Hottel Model CV-6-5 / 6-15, Specification MIL-A-52512A(ME), Class 1, 115 Volts A.C., 60 Hertz. 1 phase.
Capacity	6,000 BTU / HR
Stock Number	FSN 4120-455-7673
Manufacturer	Harvey W. Hottel. Inc.

(2) *Evaporator and condenser fan motor.*

Manufacturer	Welco Industries
Part Number	4715-20
Hp (Horsepower)	.40 / .05
Type	Double extended shaft
Volts	115
Amp (amperes)	4.25 / 1.20
Frequency	60 Hertz
Phase	1
RPM	3450, 1750
Duty	Continuous
Drive	Direct

(3) *Performance data.*

Cooling Capacity	6,000 BTU / HR nominal 6,300 BTU / HR actual at 120° F DB. Air to Condenser. 90° F DB. 75° F WB. return air-to unit.
Heating Capacity	4,500 BTU / HR (hi-heat and hi-speed positions) 2,250 BTU / HR (lo-heat and hi-speed positions)

(4) *Dimensions and weight.*

Length	17 in.
Width	17 in.
Height	28⅜ in.
Weight	153 lbs.

(5) *Evaporator and condenser fans.*

Manufacturer	Harvey W. Hottel. Inc.
Type	Condesner-propeller. Evaporator-centrifugal
Number per unit	1 each
Rotation (facing condenser air discharge grille)	Clockwise

(6) *Compressor relay.*

Manufacturer	Cutler-Hammer
Part Number	MS24192-D1
AMP	25
Type	Three pole, single throw normally open
Coil voltage	28 VDC

(7) *Temperature control thermostat.*

Manufacturer	Penn Controls
Part Number	A19AGF-10
Action	Single pole, double throw
Range	+40° F to 90° F
Differential	2° F
Electrical rating	5.8 Amps at 120 VAC

(8) *Mode selector switch.*

Manufacturer	Cutler-Hammer
Type	Rotary (Manual)
Part Number	8912K216
Number of positions	5 (hi-heat. lo-heat. off. ventilate. cool)
Electrical rating	15 amp. 250 VAC

(9) *Fan speed switch.*

Type	Single pole
Part Number	MS24523-22
Position	UP-Hi speed, DOWN-lo speed
Electrical rating	15 Amps at 28 VDC

(10 *Heater thermostat.*

Manufacturer	Metals and Controls, Inc.
Type	Klixon MWA-1256 automatic reset
Electrical rating	208Volts. 60 and 400 Hertz, 3 phase resistive load
Contacts open	194° F
Contacts close	141.8° F

(11) *Electric heaters.*

Manufacturer	Tru Heat Corporation
Type	Stainless steel sheath
Part Number	13214E3561
Voltage	120 Volts
Watts	220
Number per unit	6

(12) *Circuit breaker.*

Manufacturer	Airpax Electronics
Hold amperes	15
Trip amperes	17.3
Type	Manual reset
Auxiliary switch	Single pole - double throw
Phase	1
Frequency	60 Hertz

(13) *Transformer, control voltage.*

Manufacturer	Freed Transformer Co.
Primary Volts	115
Frequency	60 Hertz
Secondary volts	30
Ampere output	1.9
Primary connections	H-1 and H-2
Secondary connections	X-1 and X-2

(14) *Rectifier.*

Manufacturer	Syntron
Type	Bridge-hermetically sealed
Peak reverse voltage (Minimum)	200
Input (Maximum)	141 Volts AC RMS
Forward current (Maximum at 104° F.)	3 AMP DC
Part Number	SS-039

(15) *Heater control relay.*

Manufacturer	Cutler-Hammer
Part Number	MS24102-D1
AMP	25
Type	Three pole. single thro normally open
Coil Voltage	28 VDC

(16) *Capacitor.*

Manufacturer	Universal Manufacturir Corp.
Part Number	520600
Voltage	370 Volts AC
Capacitance	20 MF
Frequency	50 / 60 Hertz

(17) *Time delay relay K6.*

Manufacturer	Hi-G. Inc.
Part Number	1600-S590-3
Input voltage	26.5 Volts dc
Contact type	Single pole double throw
Time delay	30 seconds
Contact rated load	2 Amps at 28 volts dc

(18) *Time delay relay K9.*

Manufacturer	Hi-G. Inc.
Part Number	1600-S590-2
Input voltage	26.5 Volts dc
Contact type	Single pole double throw
Time delay	15 seconds
Contact rated load	2 Amps at 28 volts dc

(19) *Fan speed relay.*

Manufacturer	Arrow-Hart & Hegeman
Part Number	MTS-004
Coil voltage	24 volts dc
Contact type	4 pole double throw
Contact rated load	10 amps

(20) *Liquid line sight glass.*

Manufacturer	Sporlan Valve Co.
Type	SA-K13

(21) *Thermostat, outside air.*

Manufacturer	Stevens Mfg. Co.
Part Number	416-25
Contact Type	Single pole double throw
Control Point	50° F.
Contact Action	Open on temperature decrea

(22) *Fuse.*

Manufacturer	Bussman
Type	KAW5
Rating	5 amps

(23) *Fuse.*

Type	FO9B250V2A
Specification	MIL-F-15160 / 09
Rating	2 amps

(24) *Compressor.*

Manufacturer	Whirlpool Corporation
Model	WHP-662H-6-115-1
Type	Rotary vane
Lubrication	Forced Feed
RPM	3390

Phase	Single
Frequency	50/60 Hertz
Voltage	115
Full Load Current	12 Amps
Locked Rotor Current	49 Amps
Oil Charge	17 ounces

(25) *Pressure relief valve.*

Manufacturer	Superior Valve Company
Part Number	3001X4-540
Setting	540 PSIG
Capacity	15.9 pounds of air per minute

(26) *High pressure cutout.*

Manufacturer	Penn Controls, Inc.
Part Number	210AP40AN
Cutout Setting	460 PSIG
Reset Pressure	Manual at 415 PSIG
Contact Rating	16 Amps at 120 Volts
Contact Type	Single pole single throw, normally closed

(27) *Solenoid valve.*

Manufacturer	Jackes-Evans Manufacturing Co.
Part Number	0158
Voltage	24 Volts DC
Maximum Power	14 Watts
Current	1.02 Amps in rush
Connection sizes	⅜ inch id
Valve Type	Normally open
Number Per Unit	2 (1 liquid line, 1 compressor bypass line)

(28) *Condenser coil.*

Manufacturer	Bohn Aluminum and Brass Co.
Type	3S4
Tube size	⅜ inch od
Tube pattern	.75 x .65 staggered, 3 row
Fins	.006 thick at 15 FPI
Finned surface	14 5/16 by 9⅛ inches

(29) *Evaporator coil.*

Manufacturer	Bohn Aluminum and Brass Co.
Type	3S4
Tube size	⅜ inch od
Tube pattern	.75 x .65 staggered 4 row
Fins	.006 thick at 12 FPI
Finned surface	14½ x 5
Number of circuits	One

(30) *Dehydrator.*

Manufacturer	Alco Controls Corporation
Part Number	ADK-052
Connection sizes	¼ x 45° SAE Flare

(31) *Expansion valve (capacity control).*

Manufacturer	Alco Controls Corporation
Model Number	TCLE 50HW120-10A
Type	Angle, externally equalized
Inlet connection	⅛ id
Outlet connection	⅛ outlet
Setting	10° F superheat
Capacity	½ ton

(32) *Fluid pressure regulator.*

Manufacturer	Controls Company of America
Part Number	Model No. 104A, Device No. 70034-181
Setting	58 PSIG
Capacity	1 ton R22 at 2 PSI

(33) *Expansion valve (bypass control).*

Manufacturer	Alco Controls Corporation
Model Number	TCL25C1-15A
Type	Angle, internally equalized
Inlet connection	¼ id
Outlet connection	⅜ id
Setting	25° F superheat
Capacity	½ ton

(34) *Low pressure cutout.*

Manufacturer	Penn Controls, Inc.
Part Number	210-AP-10-AN
Cutout setting	25 PSIG
Differential pressure	25 PSIG
Contact rating	8 Amps at 240 volts ac
Contact type	Single pole, single throw normally closed, manual reset

(35) *Discharge service valve.*

Manufacturer	Robinair Manufacturing Corporation
Part Number	VUS3-46AC
Connection size	¼ id, ⅜ od

(36) *Suction service valve.*

Manufacturer	Robinair Manufacturing Corporation
Part Number	VUS3-46AC
Connection size	¼ id, ⅜ od

(37) *Fan speed control pressure switch.*

Manufacturer	Metals and Controls, Inc.
Part Number	6PS306N405N285L
Voltage	24 Volts DC
Current	5 amps at 28 volts dc-resitive 2 amps at 28 volts dc-inductive
Switch action	Single pole, single throw close on rising pressure
Setting	405 PSIG cut-in, 285 PSIG cutout

(38) *Air filter.*

Manufacturer	Research Products Corp.
Part Number	90815
Size	13⅝ by 8 9/16 by 7/8

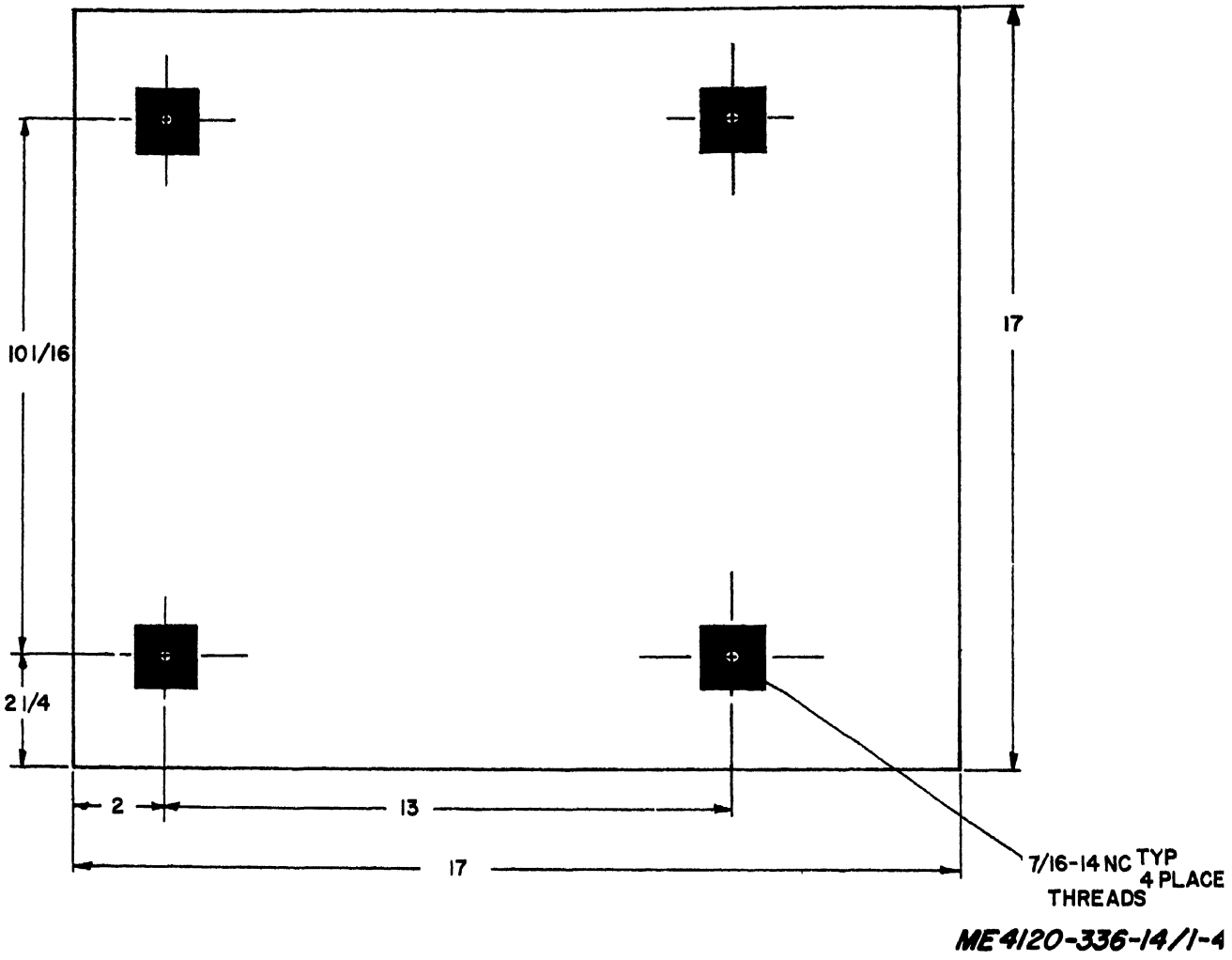


Figure 1-4. Base Plan.

Figure 1-5. Wiring diagram
(Located in rear of manual)

Figure 1-6. Refrigerant fluid diagram.
(Located in rear of manual)

Figure 1-7. Schematic wiring diagram.
(Located in rear of manual)

1-5. Difference in Models

This manual covers Harvey W. Hottel Model CV-6-5 / 6-15 Air Conditioner, Serial Nos. 101 through 337. There are no known differences between the items covered in this manual.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

2-1. Inspecting and Servicing Equipment

a. Perform daily, weekly, monthly and quarterly preventive maintenance services (table 3-1).

b. Inspect entire air conditioner for signs of damage, paying particular attention to tubing, evaporator and condenser coils and fans.

c. The air conditioner contains a full charge of refrigerant and compressor oil. No further service is required.

2-2. Installation of Separately Packed Components

a. General. The air conditioner is basically a self-contained unit; however, in certain installations it may become desirable to utilize the remote control blockoff plate with the electrical receptacle.

b. Blockoff Plate. The blockoff plate is provided for installation when the control panel assembly is removed for remote control operation. The blockoff plate provided must be used so that no air will enter the lower compartment. Refer to figure 2-1 and install the blockoff plate.

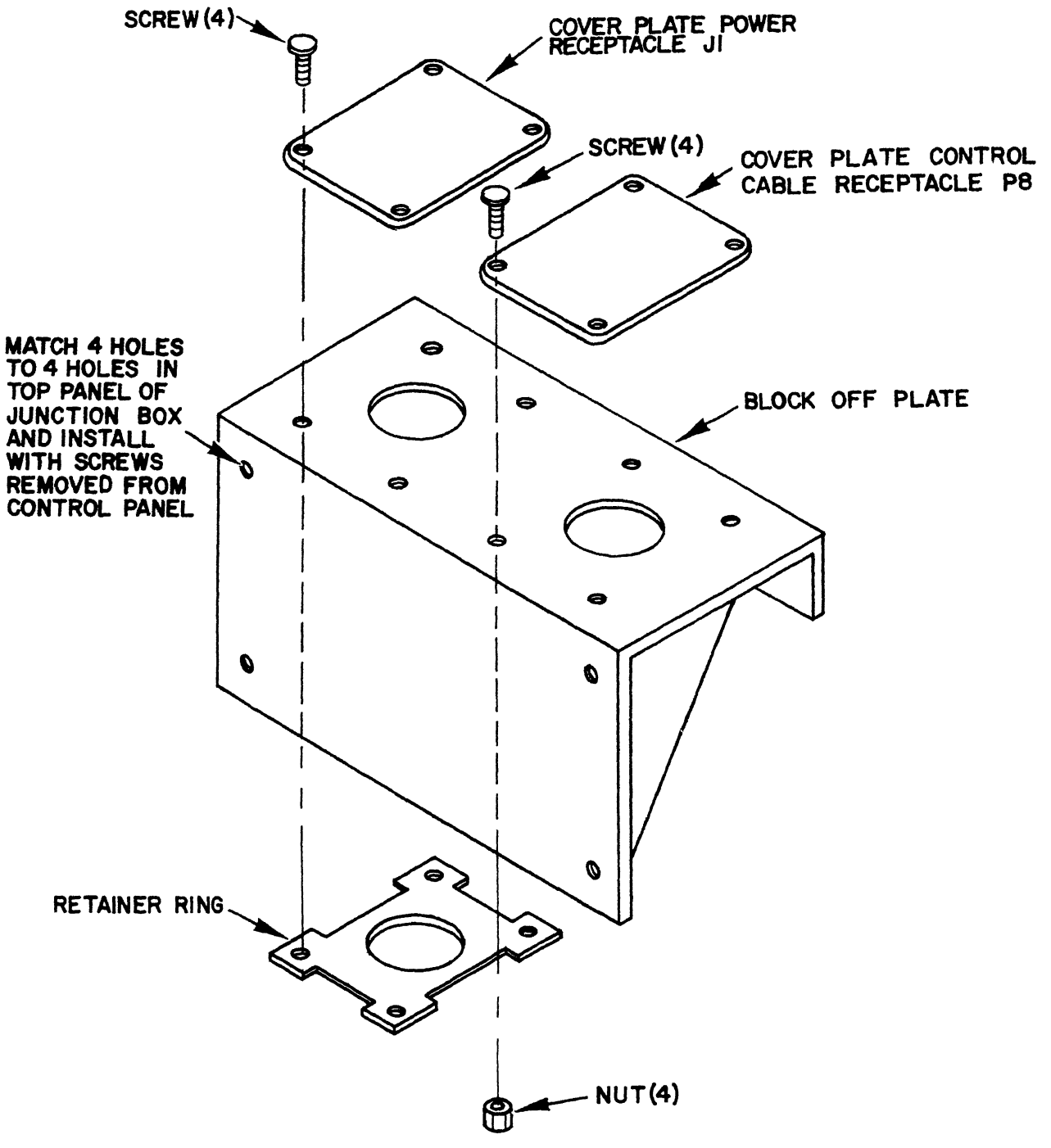


Figure 2-1. Block-off Plate.

2-3. Installation or Setting Up Instruction

a. General. Set air conditioner in a level position to allow proper condensate draining (operation will be satisfactory with the unit setting at a slight angle, not exceeding 5°, and using one of the four alternate drain connections).

b. Locating the Unit. The front access panel, discharge and intake air grilles are removable for normal service and maintenance and must be unobstructed to permit maximum unit capacity. Condenser air enters and leaves the rear of the unit.

NOTE

Remove discharge and intake air grilles and air filter, if the unit is to be used with ducts carrying air to and from the conditioned space. Install grilles and filter in the duct. If a chemical and biological filter unit is to be attached to the unit remove the CBR cover (fig. 1-2).

c. Installing Unit. Bolt unit to the floor or other flat surface. Refer to base plan (fig. 1-4; for dimensions. Connect drain hose (not less than 2 feet long and not greater than 5 / 16 inch ID) to drain connections at the bottom of the unit to lead condensate away from unit. Utilize as many of the four drain connections as possible to obtain optimum drainage. The two side drain connections are superior in performance to the front and rear connections. The rear drain provides the poorest service of the four possible connections and should be used as a single drain only if none of the remaining three connections are accessible in the mounting location utilized. Remove the desired drain plug(s) and install the drain hoses(s). Support unit at top using unit mounting receptacle (fig. 1-2).

d. Power Source.

(1) *Air Conditioner.* Operates on 115 volt, 50 or 60 Hertz, 1 phase power using the mating power plug provided.

(2) *Power Receptacle Connector.* A receptacle is located at the rear of the unit above the condenser coil air inlet. Connect the proper electrical power supply source to this receptacle using the mating plug furnished (MS3106R-20-4SX). Alternate electrical power connection locations are provided at both sides of the unit. Any location may be used by interchanging the power receptacle at the rear of the unit and one of the cover plates at the side of the unit. Be sure to attach the cover plate over the unused location at the rear of the unit to prevent air from being drawn through the opening.

e. Remote Control.

(1) *General.* The control panel may be removed from the unit and used as a remote control for operation of the air conditioner. The remote control connection and blockoff plate provided must be used when the control panel is used as a remote control.

(2) *Remote control connection.*

(a) Disconnect power source from unit.

(b) Remove front access panel and intake air grille. Disconnect the electrical connector from the control panel. Remove the air filter and thermostat remote bulb from its retaining clamp. Push the bulb through the grommet at the bottom of the bulkhead in the return air compartment.

(c) Remove four mounting screws and remove control panel. Remove the cover (fig. 2-1) in the blockoff plate. Install electrical receptacle in hole in the blockoff plate.

(d) As an alternate to *(c)* above. Remove four mounting screws and remove control panel. Remove the cover in thru-bulkhead of return air compartment. Install electrical receptacle in hole in thru-bulkhead. Refer to figure 2-2 for this alternate installation.

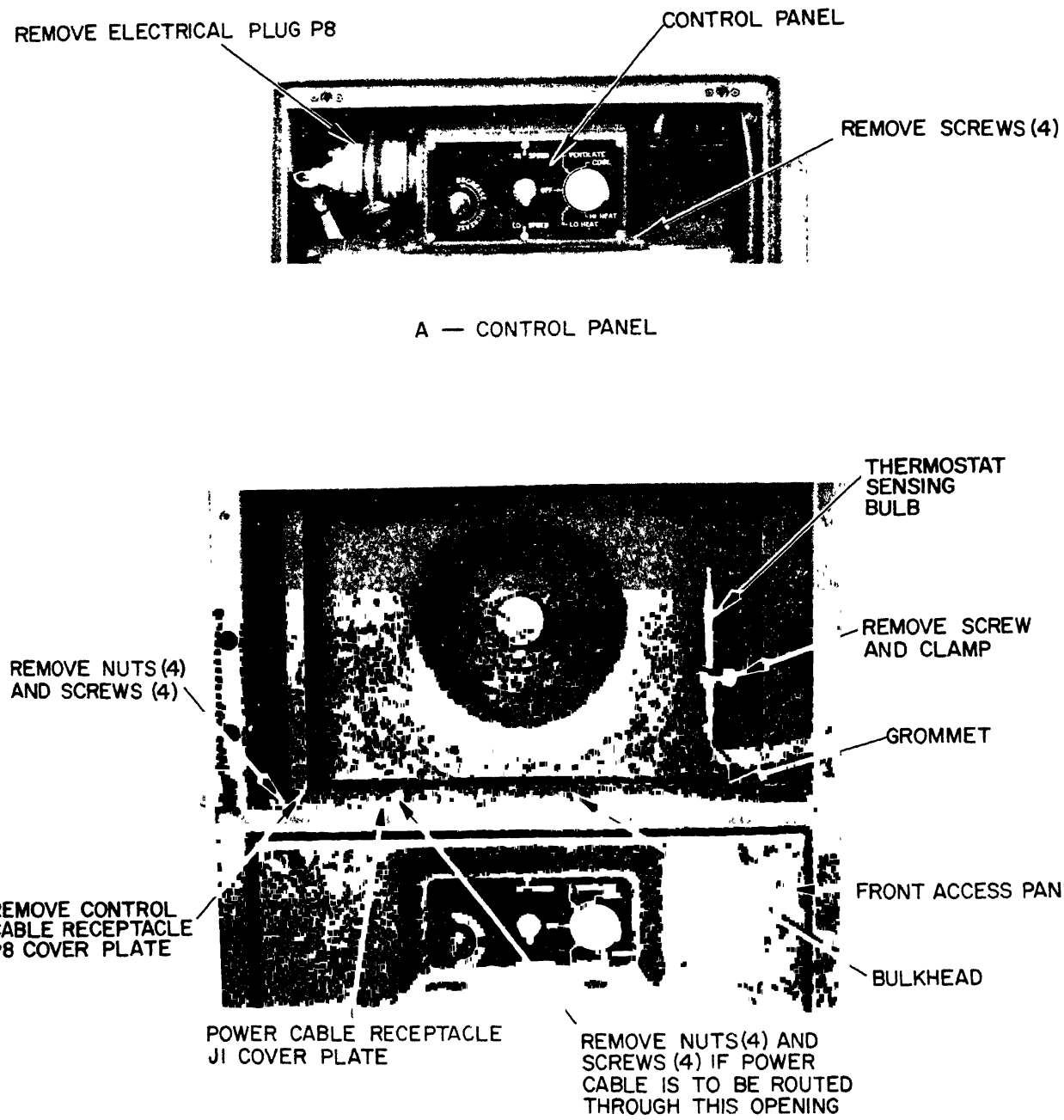


Figure 2-2. Remote control connection installation.

(e) Roll up thermostat sensing bulb and tube and secure to the rear of control panel utilizing the retaining clamp. Connect the electrical connector (disconnected (b) above) to connector in bulkhead or blockoff. Install blockoff plate with screws that mounted control panel. Connect a cable to the receptacle in the bulkhead or blockoff plate and run it to the new location of the control panel and connect the other end to the control panel receptacle. The power cable may also be relocated on the bulkhead or blockoff panel.

(f) The connecting cable may be fabricated from an MS3106R-28-17S and MS3106R-28-17P straight plug electrical connector and the required interconnecting length of Number 16 AWG wires.

(g) Reinstall front access panel.

Section II. MOVEMENT TO A NEW WORKSITE

2-4. Dismantling for Movement

a. General.

(1) Shut off electrical power supply to air conditioner and disconnect power cable from unit.

(2) Disconnect drain hose(s) from unit.

NOTE

Disconnect all duct work and remote control cable if used with unit.

(3) Unbolt unit from mounting surface.

b. Short Distance Movement. Use a forklift and lift the unit at base, or carry unit to new worksite keeping the unit vertical.

c. Long Distance Movement. Crate the air conditioner, providing adequate protection to grilles and control panel. Refer to TM 38-250 for instructions in crate fabrication, if original shipping crate is not available. Provide suitable blocking and tie-downs to prevent unit from shifting during transfer and to keep the unit vertical.

2-5. Reinstallation after Movement

Reinstall the air conditioner as instructed in paragraph 2-3.

Section III. CONTROLS AND INSTRUMENTS

2-6. General

This section describes, locates, illustrates, and furnishes the operator, crew or organizational maintenance personnel sufficient information about the various controls to insure proper operation of the air conditioner.

2-7. Controls and Instruments

The controls and instruments on the air conditioner are listed and described in table 2-1. Figures 2-3, 2-4 and 2-5 illustrate the controls and show their locations. Table 2-1 provides the control nomenclature, its reference designation, a description of the component and a description of its function.

Table 2-1. Controls and Instruments

Control	Reference designator	Description	Function
Mode Selector (fig. 2-3)	S	Four wafer, five position rotary selector switch.	Controls the air conditioner functions as follows: COOL position: Energizes contr circuits for cooling and fan drive motor. D -energizes heater control circuits. VEI TILATE position: Energizes fan dri motor, de-energizes cooling and heati circuits. OFF position: De-energizes operating circuits, turns the air condition off. LO-HEAT position: Energizes one ba of heaters and fan drive motor. HI-HEA position: Energizes primary and seconda heaters and fan drive motor, de-energiz cooling control circuits.
Circuit breaker reset knob (fig. 2-4)		Knob attached to circuit reset mechanism.	Pull knob out to reset circuit breaker if should trip. After resetting push knob ba in. Circuit breaker should remain in clos position.
High pressure cutout reset (fig. 2-4)		Part of high pressure cutout.	Push to reset, if air conditioner should cuto due to high discharge pressure.
Low pressure cutout reset (fig. 2-4)		Part of low pressure cutout.	Push to reset if air conditioner should cuto due to low suction pressure.
Temperature Control Thermostat (fig. 2-3)	S1	Adjustable, single pole double-throw, action-thermostat with range from +40 degrees to +90 degrees F with 2 degrees F differential at any particular setting.	Provides for controlling the operation of eitl the cooling circuit or heating circuit as temperature and mode selector switch setti dictate.
Fan speed switch (fig. 2-3)	S7	Single pole, single throw toggle switch.	Provides for selection of high or low speed the fan drive motor.
Fresh air damper control (fig. 2-3)		Pull chain attached to hinged door in the fresh air duct.	Provides for controlling the amount of fresh intake.
Intake air grille damper control (fig. 1-1)		Lever attached to hinged louvers on the intake air grille.	Provides for controlling the flow and directi of return air to the air conditioner.
Liquid line sight glass (fig. 2-4)	G	Liquid line sight glass approximately 1.25 inches in diameter.	Indicates liquid line system conditic Moisture in the system is indicated by t center button changing from green (dry) yellow (wet). A shortage of refrigerant indicated by bubbles in the sight glass cooling mode only).

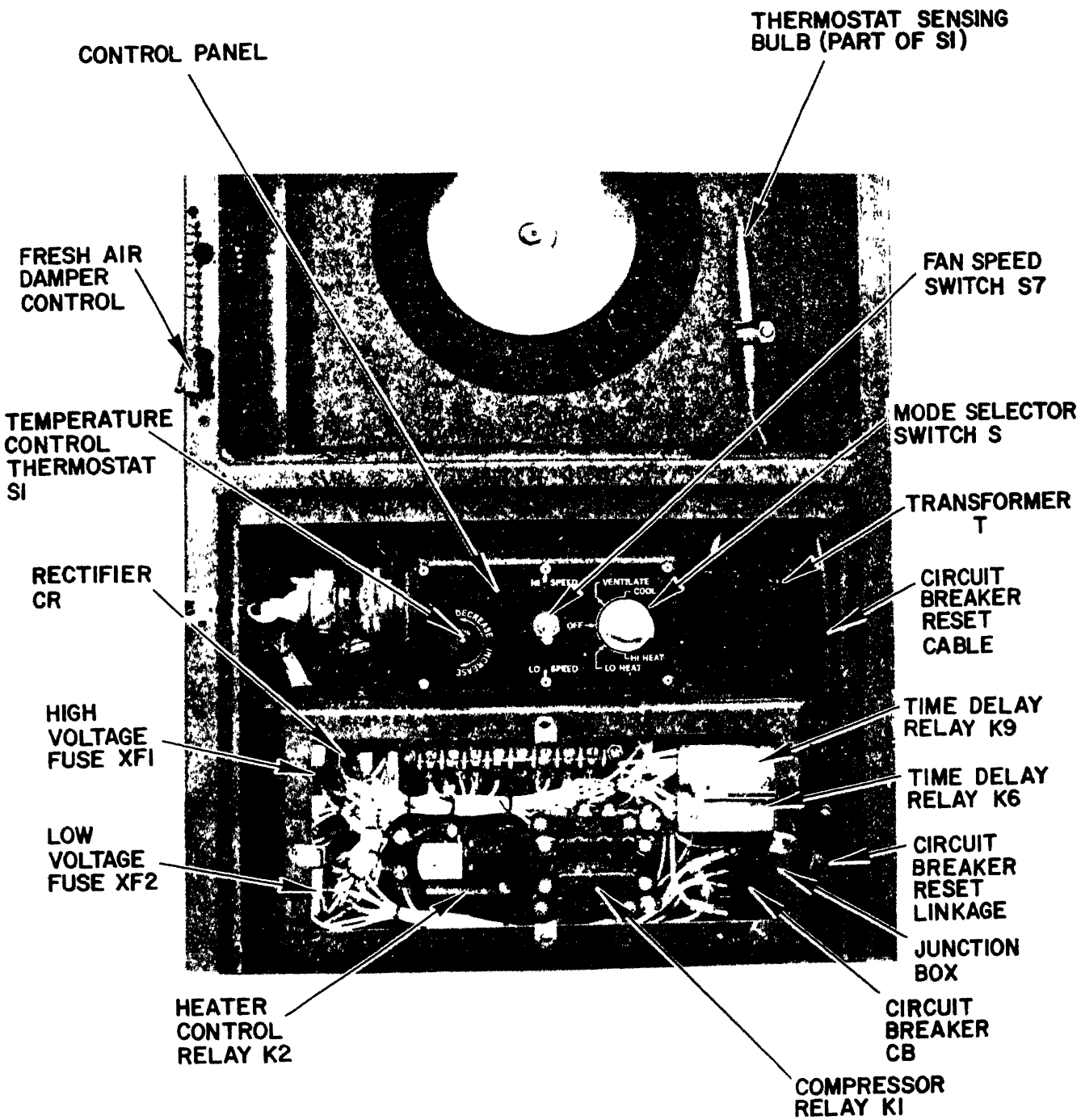


Figure 2-3. Controls and instruments (front of unit).

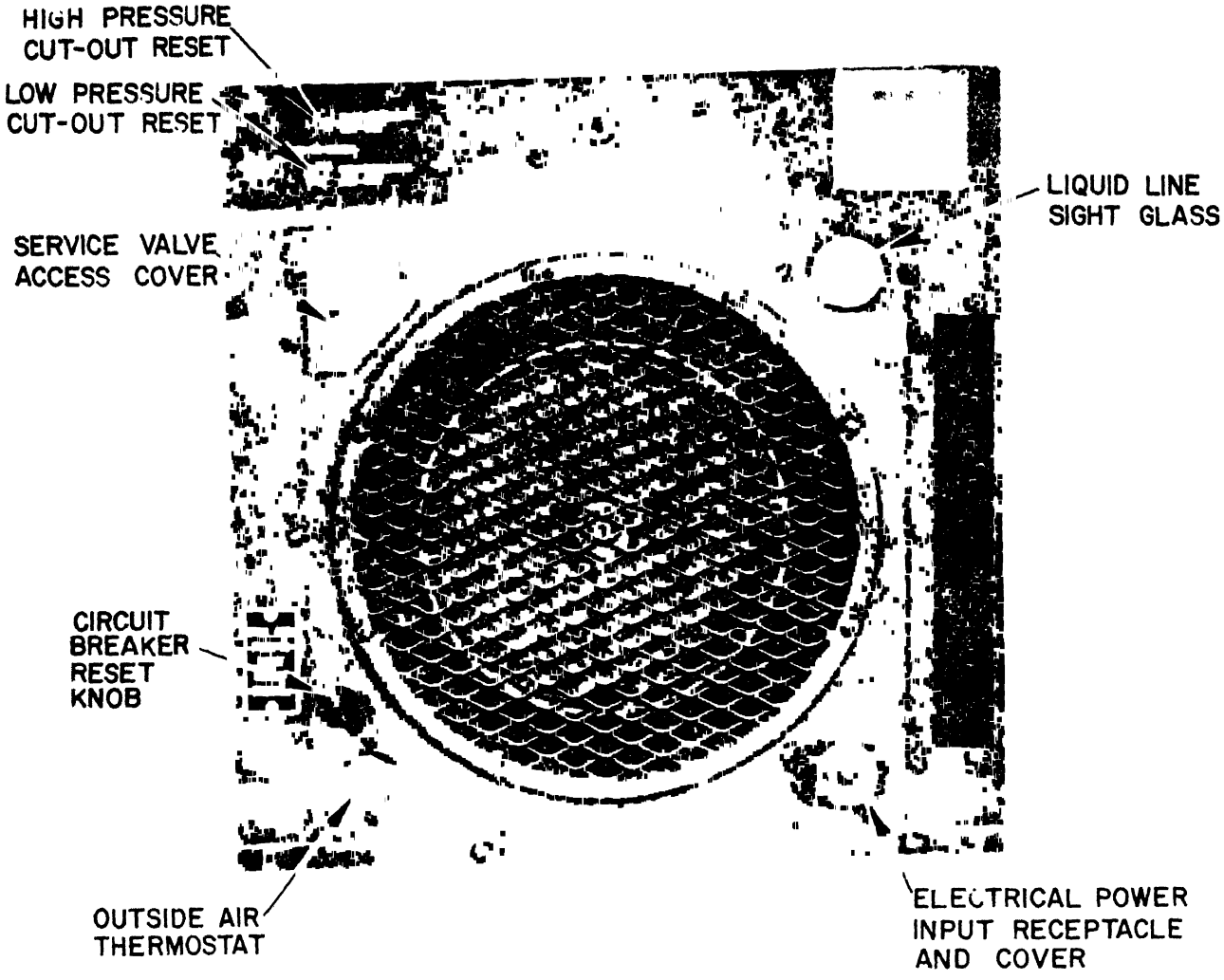


Figure 2-4. Controls and instruments (back of unit).

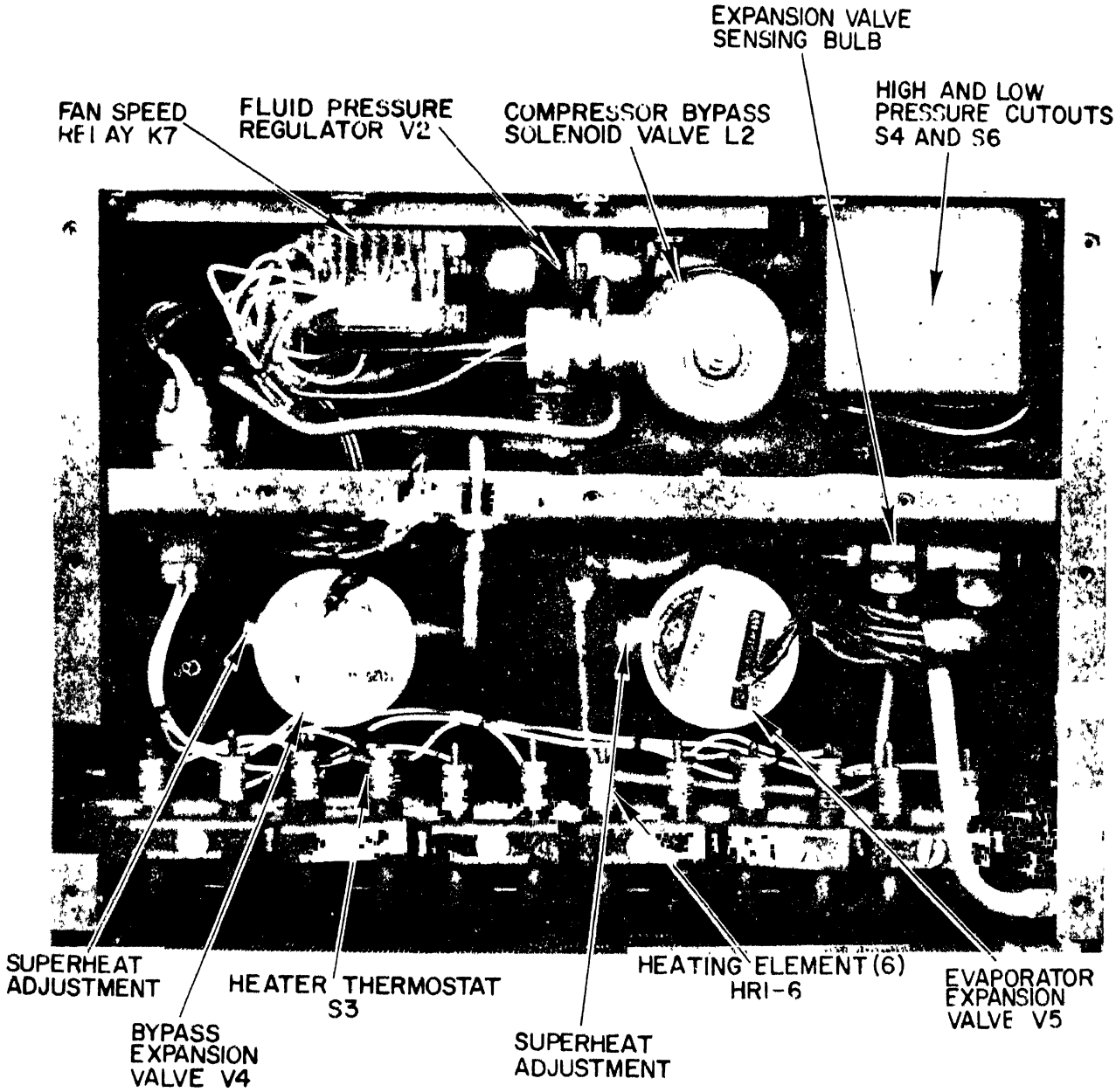


Figure 2-5. Controls and instruments (top of unit).

Section IV. OPERATION UNDER USUAL CONDITIONS

2-8. General

a. The instructions in this section are published for the information and guidance of personnel responsible for operation of the air conditioner.

b. The operator must know how to perform every operation of which the air conditioner is capable. This section gives instructions on starting, stopping and operating details of the air conditioner. Since nearly every application presents a different problem, the operator may have to vary given procedure to fit the individual job.

2-9. Starting

a. Perform daily preventive maintenance services (para 3-4).

b. Mode of operation must be established before starting the air conditioner (para 2-11).

c. If the air conditioner fails to start, pull the circuit breaker reset knob (fig. 2-4) at the rear of the unit or remove the circuit breaker access cover on the lower right side of the unit and reset the circuit breaker throw bar. (fig. 2-3). Push reset buttons on High and Low Pressure Cutout Switches. (fig. 2-4).

2-10. Stopping

Place the mode selector switch (fig. 2-3) in the OFF position.

2-11. Operation of Equipment

a. General. Four basic modes of operation are provided for in the air conditioner. Instructions for each mode of operation are provided in the instructions that follow. The operator should familiarize himself with the controls and their locations as described in table 2-1 and figures 2-3, 2-4 and 2-5.

CAUTION

Do not operate the air conditioner on the cooling or ventilating mode unless the canvas cover is rolled up or removed.

b. Cooling Mode. To operate the air conditioner in the cooling mode, perform the following procedures in sequence:

(1) Place the mode selector switch in the COOL position.

(2) Rotate the temperature control thermostat to the position for the desired temperature.

(3) Select either HI or LO fan speed by placing the fan speed switch to the desired position.

(4) For cooling with fresh makeup air, open damper door and partially close intake air grille louvers. For 100% recirculation of enclosed air, completely close the damper door. Do not completely close the intake air grille.

c. Ventilate Mode. To operate the air conditioner in the ventilate mode, perform the following procedures in sequence:

(1) Open the fresh air damper door. Intake air grille should be adjusted anywhere from partially closed to fully closed. Full closed provides 100 percent fresh air ventilation (pulling chain closes door).

(2) Place the fan speed switch to the desired speed for amount of ventilation.

(3) Place the mode selector switch in the VENTILATE position.

d. Low Heat Mode. To operate the air conditioner in the low heat mode, perform the following instructions in sequence:

(1) Open the intake air grille louvers.

(2) Adjust the air damper and secure the chain in slot.

(3) Place the mode selector switch in the LO-HEAT position.

(4) Rotate the temperature control thermostat to the position for the temperature desired.

(5) Select either HI or LO fan speed by placing the fan speed switch to the desired position.

e. High Heat Mode. To operate the air conditioner in the high heat mode, perform the following instructions in sequence:

(1) Open the intake air grille louvers.

(2) Adjust the air damper and secure the chain in slot.

(3) Place the mode selector switch in the HI-HEAT position.

(4) Rotate the temperature control thermostat to the position for the temperature desired.

(5) Select either HI or LO fan speed by placing the fan speed switch to the desired position.

Section V. OPERATION UNDER UNUSUAL CONDITIONS

2-12. Operation in Extreme Cold

a. General. The air conditioner is designed to operate at a minimum low temperature of 50 degrees F. Be sure that all thermostatic controls and dampers are in proper position.

b. Electrical System. Make sure the electrical system is free of ice and moisture.

CAUTION

Do not disturb the wiring during cold weather unless absolutely necessary.

Cold temperatures make wiring and insulation brittle and easily broken.

2-13. Operation in Extreme Heat

a. General. The air conditioner is designed to operate satisfactorily at temperatures up to 120 degrees F.

b. Ventilation. Allow sufficient room around the air conditioner for adequate air circulation.

NOTE

Do not restrict the flow of air at the intake and discharge openings of the unit.

2-14. Operation In Dusty or Sandy Areas

Clean the condenser coil and evaporator coil weekly or more often if necessary. Clean the air filter, fresh air inlet screen and condenser coil guard daily.

2-15. Operation Under Rainy or Humid Conditions

If the unit is outside and not operating, protect it with the canvas cover (fig. 1-2) or other waterproof material. Remove cover during dry periods. Open the front access panel to allow unit to dry before operating. Use caution when operating electrical equipment.

2-16. Operation In Salt Water Areas

Wash the exterior of the unit with clean fresh water at frequent intervals. Do not damage the electrical equipment during the cleaning operation. If the metal surfaces become exposed or corroded, coat the exposed surfaces with rust-proofing material. Remove corrosion and paint the exposed surface.

2-17. Operation In Snow

If the unit is outside and not operating, protect it with the canvas cover (fig. 1-2) or other waterproof material. Remove cover during dry periods and open the front access panel to allow unit to dry before operating. Make sure the electrical system is free of ice and moisture.

2-18. Operation In Mud

Use the same precautions as for humid or rainy conditions. Be sure that the condenser coil and evaporator coil are clean before operating. Clean the air conditioning filter, fresh air inlet screen and condenser coil guard daily.

2-19. Operation At High Altitudes

If the unit is being operated at high altitudes, protect it from overheating. Allow sufficient room around the air conditioner for adequate air circulation.

2-20. Operation Below Sea Level

No special instructions are required for operation below sea level, except, observe precautions of other environmental conditions present.

Section VI. MATERIAL USED IN CONJUNCTION WITH THE EQUIPMENT

2-21. Canvas Cover

a. Opening for Cooling Operation. (fig. 1-1 and 1-2). The canvas cover is fastened to the sides, bottom and top of the air conditioner with screws and washers. It may be left secured to the casing and opened for cooling or ventilating operation by opening the zippered center flap and rolling the flap up to expose the condenser air intake and discharge openings. The rolled flap may be kept in place by securing with the two turn button fasteners located on the top of the air conditioner.

CAUTION

Never operate the air conditioner on the cooling or ventilating mode unless the canvas cover is rolled up or removed completely.

b. Removal (fig. 1-2). The cover is removed from the air conditioner by removal of the 16 screws and washers securing it to the top, bottom and sides of the air conditioner. After removing the cover, replace the four screws and washers at the base of the air conditioner to secure the lower portion of the condenser coil and guard to the casing.

c. Installation (fig. 1-2). Installation of the canvas cover shall be in the reverse order of removal.

2-22. Sound Attenuator

A sound attenuator is recommended for use on this air conditioner when quieter operation is required. Sufficient clearance must be allowed when the sound attenuator is utilized. The attenuator provides a sound dampening effect for the normal sounds the air conditioner emits. It is mounted on the front of the air conditioner, and may be used in cases where the system does not have air ducts attached. The attenuator replaces the intake air and discharge air grilles. The return air enters the bottom, and the conditioned air leaves the top of the attenuator. Refer to figure 1-3 for proper sound attenuator installation.

CHAPTER 3

OPERATOR'S MAINTENANCE INSTRUCTIONS

Section I. BASIC ISSUE ITEMS

3-1. Tools and Equipment

No tools or equipment are issued with or authorized for the air conditioner.

3-2. Repair Parts

No repair parts are issued with or authorized for the air conditioner.

Section II. LUBRICATION INSTRUCTIONS

3-3. General

This unit is permanently lubricated and no lubrication is required during the life of the air conditioner.

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3-4. General

To insure that the air conditioner is ready for operation at all times, it must be inspected systematically so defects may be discovered, and corrected, before they result in serious damage or failure. The necessary preventive maintenance services to be performed are listed and described in paragraph 3-5 and Table 3-1. The item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit will be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted during operation. All deficiencies and malfunctions will be recorded together with corrective action taken on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) at the earliest possible opportunity.

Table 3-1. Preventive Maintenance Checks and Services

B — Before Operation; D — During Operation; A — After Operation; W — Weekly; M — Monthly; Q — Quarterly

Item number	Interval: Operator: Daily B	Daily D	Daily A	Operator: W	Org.: M	Org.: Q	Item to be Inspected	Procedure	Reference
1	X						Controls	Check for freedom of operation.	
		X						Check for proper function.	(para 2-11)
	X	X						Check for proper settings.	(para 2-11 and 2-9)
2	X						Discharge and Intake air grilles	Check for proper settings.	(para 2-11)
	X							Check for freedom of operation.	
3	X						Fresh air damper control	Check for freedom of operation.	
	X							Check to insure that damper door is fully in closed position.	(para 2-11)
4		X					General	Observe for unusal noises or vibration.	
	X							Check to ascertain that all panels are in place and are not damaged.	
5		X					Air flow	Check to insure that there is adequate air flow and that the temperature is being raised or lowered depending upon the mode of operation selected.	

3-5. Preventive Maintenance Checks and Services

The preventive maintenance checks and services for daily, weekly, monthly and quarterly checks are provided in Table 3-1. This table lists the item to be serviced by item number, shows the frequency at which it should be serviced, provides the procedur for checking each item listed and references th item to the appropriate service paragraph in thi manual. Figures 2-3 and 2-4 illustrate and locat the components to be serviced as listed in Table 3 1.

Section IV. TROUBLESHOOTING

3-6. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the air conditioner and its components. Malfunctions which may occur are listed in table 3-2. Each malfunction stated is followed by a list o probable causes of the trouble. The correcti action recommended is described opposite th probable cause.

Table 3-2. Troubleshooting

Malfunction	Probable Cause	Corrective Action
1. Fan motor does not operate.	No power to air conditioner.	Insure that 115 volt, 50 or 60 Hert power is available to the air con ditioner (para 2-3).
2. Fan motor runs at low speed only.	Circuit breaker contacts open.	Close circuit breaker contacts (par 2-9).
3. Insufficient air flow. Fan motor operates correctly.	*a.* Obstructions to condenser or evaporator air flow.	*a.* Remove obstructions to condense and evaporator air movement (par 2-3 and 3-9).
	b. Evaporator intake or discharge air grilles closed.	*b.* Open return or discharge air grille (para 2-11).
4. No power to low voltage control circuit.	*a.* Circuit breaker contacts open.	*a.* Close circuit breaker contact (para 2-9).
	b. No power to air conditioner.	*b.* Insure that 115 volt, 50 or 6 Hertz power is available to the a conditioner (para 2-3).
5. Compressor will not start.	*a.* Contacts of high or low pressure cutout open.	*a.* Push reset button to reset high an low pressure cutout (para 2-9).
	b. Insufficient power supply.	*b.* Insure that 115 volts, 50 or 6 Hertz power with at least a 3 ampere service is supplied to the a conditioner (para 2-3).
	c. Outdoor air temperature below setting of outside air thermostat.	*c.* Compressor will not operate belo the 50° F. setting of the outside a thermostat (para 2-12).
	d. Circuit breaker contacts open.	*d.* Close circuit breaker contac (para 2-9).
6. Compressor starts but goes out on overload.	*a.* Low voltage at compressor.	*a.* Insure that not less than 109 vol is supplied to the air condition (para 2-3).
	b. Restricted air flow to evaporator or condenser coil.	*b.* Remove obstructions to condens and air movement. Insure th evaporator intake and discharge a grilles are open (para 2-11).
7. Little or no cooling. Compressor and fan motor run properly.	*a.* Restricted air flow to evaporator or condenser coil.	*a.* Remove obstructions to condens and evaporator air movemen Insure that the evaporator intal and discharge grilles are open (pa 2-11).
	b. Excessive amount of hot outdoor air being introduced.	*b.* Insure that the fresh air damper closed to provide the minimu introduction of outdoor air f ventilation (para 2-11).
	c. Temperature control thermostat set too high.	*c.* Lower setting of temperatu control thermostat (para 2-11).
8. High pressure cutout trips excessively.	*a.* Restricted air flow to the condenser coil.	*a.* Remove obstructions to condens air movement (para 2-21).

Table 3-2. Troubleshooting—Continued

Malfunction	Probable Cause	Corrective Action
	b. Extremely high outdoor ambient temperature.	*b.* The air conditioner is designed to operate at not greater than 120° F. ambient air temperature. If tripping occurs because of excessive temperatures, raise the setting of the temperature control thermostat to reduce the cooling load (para 2-11).
9. Compressor cycles constantly.	Outdoor air temperature fluctuating near the 50° F. setting of the outside air temperature.	If cycling is excessive, shut off cooling operation and operate to obtain maximum cooling through use of the ventilation mode (para 2-11).
10. Low pressure cutout trips excessively.	Restricted air flow to the evaporator coil.	Remove obstructions to evaporator air movement. Insure that evaporator intake and discharge air grilles are open (para 2-11).
11. No heat, fan motor running properly.	Circuit breaker contacts open.	Close circuit breaker contacts (para 2-9).
12. Low heat only. Fan motor running properly.	Temperature control thermostat set too low.	Raise setting of temperature control thermostat (para 2-11).
13. Insufficient heating. Fan motor running properly.	*a.* Restricted air flow to evaporator coil.	*a.* Remove obstructions to evaporator air movement. Insure that evaporator intake and discharge air grilles are open (para 2-11).
	b. Excessive amount of cold outdoor air being introduced.	*b.* Insure that the outdoor air damper is closed to provide the minimum introduction of outdoor air for ventilation (para 2-11).
	c. Temperature control thermostat set too low.	*c.* Raise setting of temperature control thermostat (para 2-11).

Section V. OPERATOR'S MAINTENANCE

3-7. General

The instructions in this section are published for the information and guidance of the operator in maintaining the air conditioner.

WARNING

Disconnect the air conditioner from the power source before performing any maintenance on the components of the air conditioner.

3-8. Fresh Air Inlet Screen Servicing

a. Removal. Remove the fresh air inlet screen (fig. 1-2) from the rear of the air conditioner by removing 5 screws.

b. Servicing. Clean the screen by blowing with compressed air in the reverse of normal air flow. Replace the screen if damaged.

c. Installation. Install the fresh air inlet screen in reverse order of removal.

3-9. Condenser Coil Guard Service

a. Removal. Remove the condenser coil guard assembly (fig. 1-2) from the rear of the air conditioner by removing 8 screws.

b. Servicing. Wash the guard to remove accumulated dirt and other obstructions to air flow. Replace damaged guard.

c. Installation. Reinstall the condenser coil guard in the reverse order of removal.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIAL

4-1. General

Refer to Section I of Chapter 2 for information regarding procedures to be followed upon receipt of the air conditioner.

Section II. MOVEMENT TO A NEW WORKSITE

4-2. General

Refer to Section II of Chapter 2 for information regarding procedures to be followed in movement to a new worksite.

Section III. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT

4-3. Tools and Equipment

No tools and equipment are issued to organization maintenance for use in maintenance of the air conditioner.

4-4. Special Tools and Equipment

No special tools or equipment are required.

4-5. Maintenance Repair Parts

Repair parts and equipment are listed and illustrated in the repair parts and special tools list covering organizational maintenance for this air conditioner.

Section IV. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

4-6. General

To insure that the air conditioner is ready for operation at all times, it must be inspected systematically so that defects may be discovered, and corrected before they result in serious damage of failure. The necessary preventive maintenance checks and services to be performed are listed and described in paragraph 4-7 and Table 4-1. The item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit will be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted during operation, which would damage the equipment if operation were continued. All deficiencies and malfunctions will be recorded together with corrective action taken on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) at the earliest possible opportunity.

4-7. Preventive Maintenance Checks and Services Table

The preventive maintenance checks and services for monthly and quarterly checks are provided in table 4-1. This table lists the item to be checked or serviced and the minimum frequency of checking and servicing. The Table provides the procedure for checking and servicing each item by reference to the appropriate service paragraph in this manual.

Table 4-1. Preventive Maintenance Checks and Services

B — Before Operation A — After Operation M — Monthly
D — During Operation W — Weekly Q — Quarterly

Item number	Interval: Operator: Daily: B	Interval: Operator: Daily: D	Interval: Operator: Daily: A	Interval: Operator: W	Interval: Org.: M	Interval: Org.: Q	Item to be Inspected	Procedure	Reference
1						X	Condenser coil	Clean and service as required.	(para 4-6
2						X	Evaporator coil	Clean and service as required.	(para 4-6
3					X		Evaporator fan	Check for looseness, vibration, proper clearance or physical damage.	(para 4-3
4					X		Condenser fan	Check for looseness, vibration, proper clearance or physical damage.	(para 4-3
5					X		Compressor	Check during operation for unusual noise or vibration.	(para 4-5
6						X	Heating elements	Place air conditioner in high heat mode and check operation of all six heaters.	(para 4-5
7						X	Condensate drains	Disassemble ball check valve and service as required. Insure that condensate is draining to the base pan of the air conditioner.	(para 4-2
8					X		Liquidline sight glass	Check glass to insure that there is an adequate charge and that the refrigerant system is dry.	(para 4-5
9					X		Air filter	Clean and service as required.	(para 4-2
10					X		Fresh air inlet screen	Clean and service as required.	(para 4-1
11					X		Condenser coil guard	Clean and service as required.	(para 4-1
12					X		Condenser fan guard	Clean and service as required.	(para 4-1
13						X	Electrical wiring	Inspect for damage and wear.	(para 4-4
14						X	Insulation and gasketing	Repair or replace as required.	

Section V. TROUBLESHOOTING

4-8. General

This section contains troubleshooting for locating and correcting most of the operating troubles which may develop in the air conditioners. Malfunctions which may occur are listed in table 4-2. Each malfunction for an individual component, unit, or system is followed by a list of tests or inspections which will help you to determine probable causes and corrective actions to take. You should perform the tests / inspections and corrective actions in the order listed.

4-9. Malfunctions Not Listed

This manual cannot list all the malfunctions that may occur nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

NOTE

Before you use this table, be sure you have performed all applicable operating checks.

Table 4-2. Troubleshooting

Malfunction	Probable Cause	Corrective Action
1. Fan motor will not run.	*a.* Motor defective.	*a.* Replace motor (para 4-34).
	b. Open thermal overload protector on motor.	*b.* Allow motor to cool, if thermal overload remains open, replace motor (para 4-34).
	c. Defective wiring in motor control and power circuits.	*c.* Refer to fig. 1-5 for electrical checkpoints. Check connectors for tightness and wiring for continuity and shorted conditions. Repair defective wiring (para 4-49 and 4-53).
	d. Defective fan speed relay.	*d.* Replace fan speed relay (para 4-52).
	e. Defective motor run capacitor.	*e.* Replace capacitor (para 4-47).
	f. Defective mode selector switch.	*f.* Replace mode selector switch (para 4-44).
	g. Condenser or evaporator fan binding.	*g.* Insure that fan wheels turn freely in their housings (para 4-30 and 4-31).
2. Fan motor runs at low speed only.	*a.* Defective wiring in motor control and power circuits.	*a.* Refer to figure 1-5 for electrical checkpoints. Check connectors for tightness and wiring for continuity and shorted conditions. Repair defective wiring (para 4-49 and 4-53).
	b. High speed windings of motor defective.	*b.* Replace motor (para 4-34).
	c. Defective fan speed relay.	*c.* Replace fan speed relay (para 4-52).
	d. Defective motor run capacitor.	*d.* Replace capacitor (para 4-47).
	e. Defective time delay relay.	*e.* Replace time delay relay (para 4-40).
	f. Defective fan speed switch.	*f.* Replace fan speed switch (para 4-46).
	g. No power to low voltage control circuit.	*g.* See malfunction number 5.
3. Insufficient evaporator air flow. Fan motor runs correctly.	*a.* Dirty evaporator coil, fresh air inlet screen, air filter, evaporator fan wheel, discharge air grille, intake air grille or other obstructions to air movement.	*a.* Clean dirty components and remove obstructions (para 4-66, 4-18, 4-22, 4-30 or 4-13).
	b. Damaged air filter, fresh air inlet screen, intake or discharge air grille.	*b.* Replace damaged components (para 4-21, 4-18 or 4-13).
	c. Damaged evaporator fan wheel.	*c.* Replace damaged evaporator fan wheel (para 4-30).
	d. Evaporator fan wheel incorrectly positioned on motor drive shaft.	*d.* Insure that the clearance between the fan wheel and the fan inlet ring is set at the minimum to allow troublefree operation (para 4-30).

Table 4-2. Troubleshooting—Continued

Malfunction	Probable Cause	Corrective Action
	e. Damaged evaporator fan inlet ring.	*e.* Replace damaged fan inlet ring (para 4-30).
4. Insufficient condenser air flow. Fan motor runs correctly.	*a.* Dirty condenser coil, condenser coil guard, condenser fan guard, condenser fan or other obstructions to air movement.	*a.* Clean dirty components and remove obstructions (para 4-67, 4-14 or 4-31).
	b. Damaged condenser coil guard or condenser fan guard.	*b.* Replace damaged component (para 4-14).
	c. Damaged condenser fan.	*c.* Replace condenser fan (para 4-31).
5. No power to low voltage control circuit.	*a.* Blown fuse F1 or F2.	*a.* Replace blown fuse (para 4-42), after inspecting for cause of fuse failure. Refer to figure 1-5 and 1-7 for electrical check points and schematic electrical diagram.
	b. Defective wiring.	*b.* Refer to figure 1-5 for electrical check points. Check connectors for tightness and wiring for continuity and shorted conditions. Repair defective wiring (para 4-49 and 4-53).
	c. Defective mode selector switch, circuit breaker, transformer or rectifier.	*c.* Replace defective components (para 4-44, 4-37, 4-38 or 4-39).
6. Compressor will not start. Fan motor runs correctly.	*a.* No power to low voltage control circuit.	*a.* See malfunction No. 5.
	b. Defective mode selector switch, compressor run capacitor, circuit breaker, time delay relay, outside air thermostat or compressor relay.	*b.* Replace defective components (para 4-44, 4-47, 4-37, 4-40, 4-48 or 4-41).
	c. Defective wiring.	*c.* Refer to fig. 1-5 for electrical check points. Check connectors for tightness and wiring for continuity and shorted conditions. Repair defective wiring (para 4-49 and 4-53).
	d. Open compressor thermal over load protector.	*d.* Wait for the compressor to cool and check for continuity. If still open refer to GS maintenance (para 4-58).
7. Compressor starts but cycles on thermal overload protector. Fan motor runs correctly.	*a.* Defective wiring.	*a.* Refer to fig. 1-5 for electrical check points. Check connectors for tightness and wiring for continuity and shorted conditions. Repair defective wiring (para 4-49 and 4-53).
	b. Defective compressor run capacitor.	*b.* Replace capacitor (para 4-47).
	c. Restricted or insufficient evaporator or condenser air flow.	*c.* Refer to malfunction Nos. 3 and 4.
8. Little or no cooling. Compressor and fan motor run.	*a.* Compressor bypass solenoid valve does not close when the air conditioner is on the cooling mode. Liquid line solenoid remains closed when temperature control thermostat is calling for cooling.	*a.* Check wiring to solenoid valve and repair as required (para 4-49 and 4-53). Check solenoid valve electrical coil to insure that when energized, it closes.
	b. Defective temperature control thermostat.	*b.* Replace defective thermostat (para 4-45).
	c. Defective wiring.	*c.* Refer to figure 1-5 for electrical check points. Check connections for tightness and wiring for shorted conditions. Repair defective wiring (para 4-49 and 4-53).
	d. Restricted or insufficient evaporator or condenser air flow.	*d.* Refer to malfunction Nos. 3 and 4.

Table 4-2. Troubleshooting—Continued

Malfunction	Probable Cause	Corrective Action
	e. Remote bulb of evaporator expansion valve or bypass expansion valve not in good contact with refrigerant suction line or not properly insulated.	*e.* Securely clamp bulb to suction line after insuring that there is solid metal to metal contact along the entire length of the bulb. Replace damaged insulation around the bulb and the suction line (para 4-62).
9. Compressor cycles intermittently.	Defective time delay relay or compressor relay.	Replace defective component (para 4-40 or 4-41).
10. High pressure cutout trips excessively.	Restricted or insufficient condenser air flow.	Refer to malfunction No. 4.
11. Low pressure cutout trips excessively.	Restricted or insufficient evaporator air flow.	Refer to malfunction No. 3.
12. No heat. Fan motor runs correctly.	*a.* Defective heater thermostat, mode selector switch or circuit breaker.	*a.* Replace defective components (para 4-51, 4-44 or 4-37).
	b. Defective wiring.	*b.* Refer to fig. 1-5 for electrical check points. Check connections for tightness and wiring for shorted conditions. Repair defective wiring (para 4-49 and 4-53).
13. Low heat only. Fan motor runs correctly.	*a.* Defective temperature control thermostat, heater control relay or mode selector switch.	*a.* Replace defective components (para 4-45, 4-41 or 4-44).
	b. Defective wiring.	*b.* Refer to fig. 1-5 for electrical check points. Check connections for tightness and wiring for shorted conditions. Repair defective wiring (para 4-49 and 4-53).
	c. No power to low voltage control circuit.	*c.* Refer to malfunction No. 5.
14. Insufficient heating. Fan motor runs correctly and heater controls operating properly.	*a.* Restricted or insufficient evaporator air flow.	*a.* Refer to malfunction No. 3.
	b. Defective heating element (s).	*b.* Replace defective heating elements (para 4-50).
	c. Defective wiring.	*c.* Refer to figure 1-5 for electrical check points. Check connections for tightness and wiring for shorted conditions. Repair defective wiring (para 4-49 and 4-53).
15. Air conditioner noisy.	*a.* Fan wheels out of balance, binding or dirty.	*a.* Clean fan wheels and align so that they turn freely without interference with housings or guards. If wheel is out of balance after cleaning replace with a new wheel (para 4-30 and 4-31).
	b. Fan wheels loose on drive shaft.	*b.* Tighten set screws and check to insure that the key is in place (para 4-30 and 4-31).
	c. Fan motor loose on mount.	*c.* Tighten mounting screws which secure the motor to the partition and the motor mounting bracket (para 4-34).
	d. Compressor mounts loose.	*d.* Tighten four bottom compressor mounting bolts (para 4-58).

Section VI. MAINTENANCE OF PANELS, COVERS, SCREENS, GUARDS AND GRILLES

4-10. General

Refer to figures 1.1 and 1.2 for the location of panels, covers, screens, guards and grilles.

4-11. Top Panel

a. General. Removal of the top panel is necessary to provide access for servicing the

heating elements, heater thermostat, fan speed relay, expansion valves, fluid pressure regulator, pressure switches and the compressor bypass solenoid valve.

b. Removal. Remove the 15 screws and washers which secure the top panel to the top of the air conditioner casing and the five screws and washers which secure the top panel to the top rear of the casing. Loosen the two top screws which secure the discharge air grille to the front of the casing. The top panel may then be lifted off for maintenance of interior components or inspection and repair of the gasketing and insulation affixed to the top panel and the air conditioner casing.

c. Servicing. Servicing of the top panel consists of re-gluing of loose gasketing or insulation or replacement of defective gasketing and insulation. The 15 washers originally removed should be inspected and loose or defective washer gaskets should be replaced before re-installation.

d. Installation. Installation of the top panel shall be in the reverse order of removal. All missing mounting hardware shall be replaced during installation.

4-12. Front Access Panel

a. General. The front access panel must be removed for access to the air conditioner control panel and junction box, condensate drain tubes, capacitors, liquid line solenoid valve, dehydrator, pressure relief valve, and the compressor.

b. Removal. Loosen the two screws at the top of the front access panel. Tilt the panel out at the top and lift up and out of the air conditioner casing.

c. Servicing. Servicing of the front access panel consists of re-gluing or replacement of loose or defective gasketing or insulation. The two mounting screws should be checked to insure that the screw retaining washers are in place.

d. Installation. Installation of the front access panel shall be in the reverse order of installation.

4-13. Discharge and Intake Air Grilles

a. General. The discharge air grille must be removed to provide access to the evaporator coil. The intake air grille must be removed to provide access to the air filter, thermostat sensing bulb, fan inlet ring, evaporator fan, fresh air inlet damper and the evaporator / condenser fan motor. The grilles serve to control the amount and direction of flow of evaporator air.

b. Removal. The discharge or intake air grilles are removed by removing the four screws and washers which secure each grille to the air conditioner casing.

c. Servicing. Servicing consists of re-gluing or replacement of loose or defective gasketing. Check to insure that the louvers, particularly on the intake air grille operate freely. If the louvers are excessively tight, application of dry graphite, Federal Specification SS-G-659, to all points of relative motion will provide free operation. Clean accumulated dirt and debris from the grilles.

d. Installation. Installation of the discharge and intake air grilles shall be in the reverse order of removal. Care shall be taken during installation of the intake air grille to insure that the damper door control chain operates freely.

4-14. Condenser Coil Guard and Condenser Fan Guard

a. General. The condenser coil guard and condenser fan guard protect the condenser coil and fan, respectively, from physical damage and the introduction of large contaminants such as paper or leaves from entering to degradate their performance. The condenser fan guard also serves to protect personnel from physical injury through contact with the rotating condenser fan. The condenser fan guard must be removed to provide access to the condenser fan, the condenser / evaporator fan motor, the refrigerant piping system and unit wiring harnesses.

b. Removal. Removal of the condenser fan guard is accomplished by removing 8 screws and washers located around the periphery of the guard which secure it to the back of the casing. Removal of the condenser coil guard is accomplished by removing the screws and washers located along the top and bottom of the guard.

CAUTION

Do not operate the air conditioner with the condenser fan or coil guard removed.

c. Servicing. The only servicing required for the condenser coil and fan guard consists of cleaning accumulated dirt and debris to provide unrestricted air flow. Minor deformations of the expanded metal in the guards may be straightened to restore the guard to a serviceable condition. Guards in which the expanded metal or frames are broken or in which welds are cracked should be replaced.

d. Installation. Installation shall be in the reverse order of removal. Care shall be taken in installation of the coil and fan guard to insure that condenser air leaves the fan directed upward from the coil and enters the coil in an upward direction from the outside to the inside face of the condenser coil guard.

4-15. Service Valve Access Cover

a. General. The service valve access cover must be removed for access to the suction and discharge service valves. The cover must be removed to provide access for installation of charging and pressure test gauges to the suction and discharge service valves.

b. Removal. Remove the service valve access

cover by removing the two mounting screws which secure the cover to the rear of the casing.

c. Servicing. Servicing of the service valve access cover consists of re-gluing or replacement of loose or defective gasketing.

d. Installation. Installation of the service valve access cover shall be in the reverse order of removal.

4-16. Circuit Breaker Reset Access Cover

a. General. The circuit breaker reset access cover provides access to the circuit breaker trip bar from the right side of the air conditioner.

b. Removal. Remove the circuit breaker reset access cover by loosening the two captive mounting screws.

c. Service. Servicing of the circuit breaker reset access cover consists of re-gluing or replacement of loose or defective gasketing. The two mounting screws should be checked to insure that the screw retaining washers are in place.

d. Installation. Installation shall be in the reverse order of removal.

4-17. CBR Cover

a. General. The CBR cover is provided to seal off the Chemical, Biological, Radiological (CBR) duct opening in the rear of the air conditioner. This cover should always be in place unless an external CBR unit is utilized to provide fresh, filtered outdoor air to the air conditioned space.

b. Removal. Remove the CBR cover by removing the five screws and washers which secure it to the upper left corner of the back of the air conditioner casing.

c. Service. Servicing of the CBR cover consists of re-gluing or replacement of defective gasketing.

d. Installation. Installation shall be in the reverse order of removal.

4-18. Fresh Air Inlet Screen

a. General. The fresh air inlet screen prevents large contaminats from entering the air conditioner through the fresh air duct.

b. Removal. Remove the fresh air inlet screen by removing the five screws and washers which secure it to the upper right corner of the back of the air conditioner casing.

c. Service. Service of the fresh air inlet screen consists of cleaning to remove accumulated dirt and dust. Cleaning may usually be accomplished by washing and scrubbing in the case of severe accumulation of contaminants. Dry the screen thoroughly before putting back into service.

d. Installation. Installation shall be in the reverse order of removal.

4-19. Alternate Power Connection Covers

a. General. Openings are provided on each side of the air conditioner for installation of the air conditioner power input cable. The power receptacle is normally connected to the rear of the air conditioner just above the condenser coil. In the event the power input is required to be on the side of the air conditioner this receptacle may be disconnected from the casing and fastened to the casing through the opening in either of the sides.

b. Removal. The front access panel and the junction box and control panel must be removed to provide access to the four nuts which secure the screws which retain the alternate power connection covers. If the power input receptacle is to be installed in either of the two side openings it should be removed by removing the four nuts and screws which secure it to the casing. A retaining ring with four top screw holes is an integral part of the wiring harness of which the power input recpetacle is an integral part.

c. Installation. When the electrical input receptacle is moved to the side location, secure it to the unit casing by installing the four screws which secured it to the rear panel through the holes at the new location. These screws are threaded through the retaining ring which is part of the wiring harness. Be sure to install the alternate power connection cover over the opening left where the power input receptacle was previously installed. Use the same four nuts and screws previously utilized for installation in the side location. When installing the power input receptacle be sure that the receptacle cover chain is secured to one of the four mounting screws. When the power input cable is not installed, cover the power input receptacle with the receptacle cover.

Section VII. MAINTENANCE OF THE AIR FILTER

4-20. General

The air filter is located behind the intake air grille in the air conditioner. The filter removes dust and contaminants from the air entering the evaporator compartment thus protecting the evaporator coil and other components from becoming fouled by dirt in the air. For this reason it is very important that the filter be inspected and serviced with regularity.

4-21. Removal

Remove the intake air grille (para 4-13). Spring the right side of the filter from under the spring clip located near the center right side of the filter. Slide the filter out from the left hand retaining channel.

4-22. Service

Wash the filter with dry cleaning solvent, Federal Specification P-D-680, and dry with clean, low pressure, compressed air. Dip or spray the filter with "Filter Kote" or oil, Specification M11-L-2104, Grade 20 or better. Drain off excess oil before installation.

4-23. Installation

Install the air filter in the reverse order of removal.

Section VIII. MAINTENANCE OF THE CONDENSATE DRAIN SYSTEM

4-24. General

When the condensate drain system is opened for maintenance, all hoses and tubes which are disconnected should be removed, inspected and reinstalled securely.

4-25. Removal

Remove the front access panel (para 4-12), the control panel and junction box (para 4-36). Remove the nut, clamp and screw which secure the lower portion of each drain tube to the junction box mounting bracket. Loosen each of the two hose clamps which secure the short piece of rubber drain tubing to the drain tube assembly and to the drain tubing which is welded into the casing assembly. Slip the drain tube assembly and the rubber drain tube out of the air conditioner. Remove the discharge air grille (para 4-13).

4-26. Service

Remove the cotter pin from the lower end of the drain tube assembly. Remove the compression spring and the ball check from the drain tube assembly. Clean accumulated debris from the condensate drain pan located under the evaporator coil. Blow out the drain tubes which are integral to the casing, the rubber drain tubes and the drain tube assemblies with compressed air. Clean the ball and compression spring with dry cleaning solvent, Federal Specification P-D-680, and dry thoroughly. Inspect the ball and ball seat for pitting or scratches which would affect tight sealing. Inspect the spring for proper tension. Inspect the rubber hoses for signs of wear and inspect all parts for cracks, weld, breaks or other defects. Replace or repair as required.

4-27. Installation

Installation of the condensate drain system shall be in the reverse order of removal.

Section IV. MAINTENANCE OF THE CIRCUIT BREAKER RESET MECHANISM

4-28. General

The circuit breaker actuator cable provides a means of re-setting the circuit breaker without the necessity of removing any panels or covers. The reset knob is located at the rear of the air conditioner as shown in figure 1-2.

4-29. Test and Adjustment

Remove the front access panel (para 4-12). The circuit breaker reset bar is located at the lower right side of the junction box. Raise the circuit breaker to its full UP position. It should hold in this position with no interference between the reset mechanism and its securing hardware. If there is interference loosen the junction box from the two side mounting brackets by loosening the two mounting screws at each side. Loosen the screws holding the two clamps which secure the circuit breaker actuator cable to the right side of the junction box. Move the actuator cable up through the clamps to provide the maximum amount of clearance between the cable sleeve and circuit breaker throw bar linkage. Secure the junction box to its mounting brackets. Pull out the circuit breaker actuator cable knob at the rear of the air conditioner and adjust the end fitting core on the reset cable to insure that the circuit breaker is in the full UP position. Push the circuit breaker actuator cable knob all the way in. Depress the circuit breaker throw bar and insure that it goes to the full DOWN position. If it does not readjust the end fitting core.

Section X. MAINTENANCE OF EVAPORATOR AND CONDENSER FANS

4-30. Evaporator Fan

a. General. The air conditioner is equipped with an impeller type centrifugal evaporator fan. The evaporator fan is mounted on one end of the double shafted evaporator / condenser fan motor. The direction of rotation is counter clockwise when viewed from the front of the air conditioner.

b. Removal. Removal of the evaporator fan must be accomplished by the following:

(1) Remove the intake air grille (para 4-13).

(2) Remove the air filter (para 4-21).

(3) Remove the inlet ring by removing the six screws and washers.

(4) Loosen the two set screws in the fan hub using a ⅛ inch Allen type wrench.

(5) Remove the fan wheel from the motor shaft. If the wheel will not move by hand, utilize a wheel puller with a center piece of not greater than ½ inch diameter. In the event a wheel puller is not available, two 5/16-18 screws may be inserted in the two threaded holes located in the fan hub. These screws should be tightened evenly against the motor flange to remove the fan wheel.

c. Service. Service of the fan wheel consists of cleaning accumulated contamination. The wheel should be inspected for cracked welds, bent blades or cones and concentricity of the cone to the back plate. Defective wheels should be replaced before the air conditioner is returned to service.

d. Installation. Installation of the evaporator fan shall be in the reverse order of removal. Place the fan wheel on the motor shaft with the keyways aligned. Install the key into the keyway and drive in so it is flush with the hub of the fan wheels. Pressure should only be applied only to the hub of the wheel during installation to prevent distortion of the cone and blades. The wheel should be installed so that there is a minimum amount of clearance between the cone of the wheel and the fan inlet ring. The end of the fan hub should be flush with the end of the motor shaft at this condition. Torque the two set screws to 82 inch pounds when fully tightened. A bent or broken fan inlet ring should be replaced. After installation of the fan wheel and inlet ring spin to insure that there is no mechanical interference and that the fan wheel turns in a concentric pattern around the shaft.

4-31. Condenser Fan

a. General. The air conditioner is equipped with an axial type condenser fan. The condenser fan is mounted on one end of the double shafted evaporator / condenser fan motor. The direction of rotation is clockwise when viewed from the back of the air conditioner.

b. Removal. Removal of the condenser fan must be accomplished by the following steps.

(1) Remove the condenser fan guard (para 4-14).

(2) Loosen the two set screws in the fan hub using a ⅛ inch Allen type wrench.

(3) Remove the fan wheel from the motor shaft. If the wheel will not move by hand, utilize a wheel puller with a center piece of not greater than ½ inch diameter. In the event a wheel puller is not available, two ¼-20 screws may be inserted in the two threaded holes located near the center of the wheel. These screws should be tightened evenly against the motor end bell to remove the wheel.

c. Service. Service of the fan wheel consists of cleaning accumulated contamination.

d. Installation. Installation of the condenser fan shall be in the reverse order of removal. Place the fan wheel on the motor shaft with the keyways aligned. Install the key into the keyway and drive in so that it is flush with the hub of the fan wheel. The wheel should be installed so that the end of the hub is flush with the end of the motor shaft. Torque the two set screws to 82 inch pounds. After installation of the wheel, spin to insure that there is even clearance between the outside of the wheel and the fan shroud. After installation of the fan guard, check to insure that there is no mechanical interference between the guard and the wheel.

Section XI. MAINTENANCE OF FAN MOTOR

4-32. General

The evaporator / condenser fan motor is a double shafted, dual speed permanent split capacitor motor which drives both the condenser and evaporator fans. The motor is flange mounted to the bulkhead between the evaporator and condenser compartments. The overload protector is located inside the motor housing. Its purpose is to protect the motor from the effects of excessive temperature or current draw.

4-33. Fan Motor Testing

Obtain access to the fan motor by removing the condenser fan (para 4-31). Remove the electrical connector from the terminal box located on the lower portion of the motor housing near the motor mounting flange. Test the fan motor for resistance with a multimeter set on the low ohm scale. Touch the loads of the multimeter to the pins of the electrical receptacle connector. The multimeter should indicate a low resistance value across each pair of pins. The resistance from Terminal C to Terminals B and E should be greater than the resistance from Terminal C to Terminals A and D. An open circuit reading from Terminal C to all the remaining four pins indicates that the internal thermal protector is open. If this is the case, sufficient time should be allowed for the thermal protector to cool and close. If a resistance check still indicates open circuits to all four pins from C, the thermal protector is defective and motor must be

replaced. An open circuit from C to some, but not all the remaining pins is evidence that one or more of the windings is open circuited and the motor must be replaced. Connect one lead of the multimeter to the motor frame and the second lead to each of the five pins in the receptacle. An indication of negligible resistance is evidence of a short in the motor and it must be replaced.

4-34. Fan Motor Removal and Installation (fig. 4-1)

a. Removal.

(1) Remove the condenser fan (para 4-31).

(2) Remove the evaporator fan (para 4-30).

(3) Disconnect the electrical connector fro the terminal box located on the lower portion of t motor housing near the motor mounting flange.

(4) Remove the two screws, washers, loc washers and sleeves which secure the mot mounting feet to the motor mounting bracket.

(5) Remove the four nuts, washers and screv which secure the motor mounting flange to t bulkhead separating the evaporator and condens compartments.

(6) Lift the motor out of the air conditione

b. Installation. Installation of the fan mot shall be in the reverse order of removal.

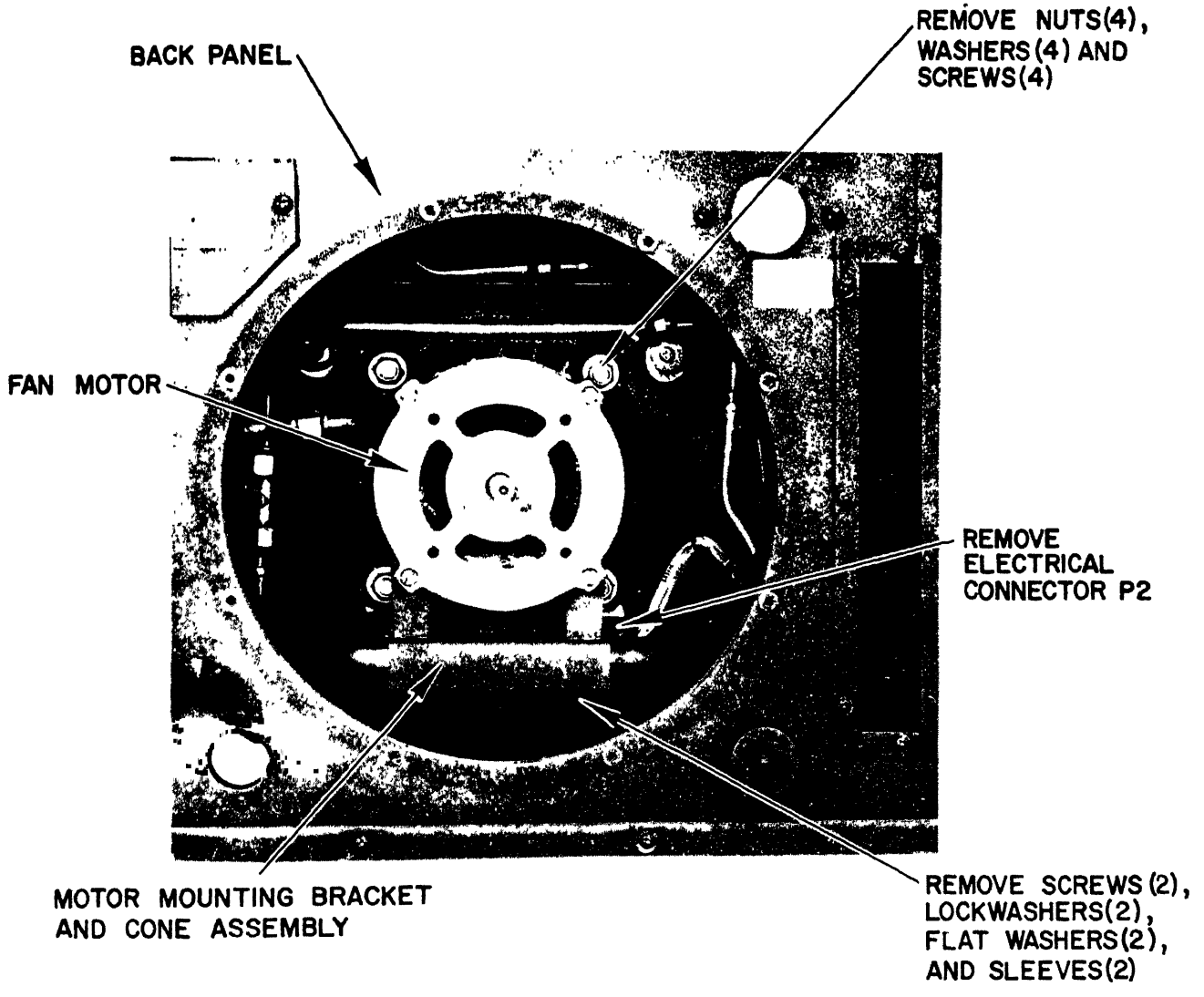


Figure 4-1. Fan Motor Removal and Installation.

4-35. General

The heart of the air conditioner electrical system is the junction box and control panel which are mounted behind the front access panel. Components not integral to these two electrical boxes are the fan motor and compressor, start/run capacitors, electric heating elements, fan speed relay, heater thermostat, solenoid valve coils, and outside air thermostat. In addition to these components there are three wiring harnesses in the air conditioner to interconnect them to the junction box and control panel. It is necessary to remove the junction box and control panels from the air conditioner to service most of the components integral to them.

4-36. Removal, Service and Installation of the Junction Box and Control Panel

a. General. It is necessary to completely remove the junction box and control panel for access to some components located in the lower portion of the air conditioner. The electrical connections (three electrical connectors and the electrical ground wire) do not have to be disconnected for most servicing of the junction box and control panel.

b. Removal of Junction Box for Servicing and Replacing Components.

(1) Remove the front access panel (para 4-12).

(2) Loosen the four screws which secure the junction box to its right and left hand mounting brackets.

(3) Loosen the two clamps located on the right end of the junction box which secure the circuit breaker actuator cable. Remove the end fitting core from the end of the actuator cable and slide the cable out of the two clamps which held it.

(4) Remove the intake air grille (para 4-13) and the air filter (para 4-21). Remove the clamp which secures the thermostat sensing bulb to the case by removing the screw which secures it to the casing.

(5) Slide the thermostat bulb through the grommet located in the partition above the junction box. Take care to insure that the capillary tube does not become kinked or broken.

(6) Remove the front cover from the junction box by loosening the four captive screws which secure it to the front flanges of the junction box.

(7) Slip the junction box with the control module attached out of the air conditioner casing.

c. Removal of Control Panel for Servicing.

(1) Follow the steps outlined in paragraph 4-35 *b* to remove the junction box.

(2) Remove the control panel from the junction box by removing the four screws which secure it to the top of the junction box.

(3) Remove the knob from the thermostat by loosening the two set screws with a .050 Hexagon Head wrench.

(4) Remove the back panel of the control panel by removing the four nuts and screws which secure it to the control panel.

d. Complete Disconnection of Junction Box.

(1) Follow the steps outlined in paragraph 4-35 *b* to partially remove the junction box.

(2) Disconnect the two electrical connectors on the back left side of the junction box and the connector on the left side of the control panel.

(3) Remove the hex head screw which secures the front left corner of the casing to the bottom panel of the air conditioner and remove the electrical ground wire.

(4) Remove the junction box and control panel from the air conditioner.

e. Servicing. Servicing consists of test, inspection or replacement of defective electrical components included in the junction box or control panel. All gaskets and insulation should be inspected for defects and proper adhesion to the metal surfaces and re-glued or replaced as required. Check the four captive screws on the junction box cover and the four which secure the junction box to the right and left side mounting brackets to insure that the retaining washers are in place to retain the screws in their respective mounting holes. Wiring harnesses and wire leads should be checked to insure that all connections are tight, the wire insulation is servicable and that the wiring is routed and tied to prevent chafing on sharp edges or interference with internal components.

f. Installation. Installation shall be in the reverse order of removal.

4-37. Circuit Breaker

a. Function. This is a two pole breaker with a mechanically interlocked auxiliary switch. The circuit breaker opens if there is excessive current draw by the compressor or the electric heating elements. The auxiliary switch opens when the main poles open and de-energizes the low voltage control system of the air conditioner.

b. Testing. Remove the junction box from the air conditioner (para 4-36 *b*). Disconnect and tag all wire leads. Check for continuity between each pair of wire terminals when the circuit breaker is closed and open circuit when open. Check for insulation resistance between the three electrical circuits. Lack of continuity when closed, open circuit when open or low insulation resistance between circuits indicates that the circuit breaker is defective and should be replaced.

c. Removal. Remove the six screws which secure the circuit breaker and metal cover to the right end of the junction box. Remove the plastic circuit breaker cover. Drive the steel pin out of the circuit breaker throw bar and remove the actuator arm. Remove the circuit breaker from the junction box.

d. Installation. Installation shall be in the reverse order of removal. When installing a new circuit breaker, discard the spacer on the throw bar to allow installation of the actuator arm.

4-38. Transformer

a. Function. The transformer steps down the 115 volt input voltage to 30 volts for operation of all electrical controls.

b. Testing. Remove the junction box from the air conditioner (para 4-36 *b*). Check the output terminals X1 and X2 for a voltage of 29 to 31 volts with an air conditioner input voltage of 115 volts and with the mode selector switch set to any of the four operating positions. Disconnect all power to the air conditioner and remove and tag the four leads to the transformer. Remove the capacitor connected across the two output terminals and check for a high insulation resistance between the four terminals and case of the transformer. Check for continuity between terminals H1 and H2 and X1 and X2. Any low insulation resistance or lack of continuity indicates that the transformer is defective and must be replaced.

c. Removal. Remove the four hexagon nuts, eight flat washers and four lock washers which secure the transformer to the top right side of the junction box after removing and tagging four wire leads and capacitor. Remove the transformer.

d. Installation. Installation shall be in the reverse order of removal. Insure that the gasket under the transformer is in servicable condition. Be sure that the capacitor is re-installed across the two output terminals X1 and X2 of the transformer.

4-39. Rectifier

a. Function. The rectifier is used to rectify the AC current to provide DC power to operate the control circuit.

b. Testing. Remove the junction box from the air conditioner (para 4-36 *b*). Tag and disconnect the four wire leads from the rectifier. Using an ohmmeter measure the resistance between terminals as follows:

Ohmmeter Probe	*Terminal*	*Ohmmeter Probe*	*Terminal*	*Resistance*
+	2	—	3	Low
+	2	—	4	Low
+	2	—	1	Low
+	4	—	3	Low
+	1	—	3	Low
+	3	—	1	High
+	3	—	4	High
+	4	—	2	High
+	1	—	2	High

Resistances not in accordance with the above test indicate a defective rectifier.

c. Removal. Remove the nut and lockwasher which secure the rectifier to the top left side of the junction box.

d. Installation. Installation shall be in the reverse order of removal.

4-40. Time Delay Relays, K6 and K9

a. Function. The air conditioner is equipped with two time delay relays. Time delay relay K6 prevents the compressor from starting for a time of 30 seconds after selection of the cooling mode of operation. Time delay relay K9 prevents the condenser / evaporator fan motor from starting on high speed for 15 seconds after placing the air conditioner in any of the four modes of operation.

b. Testing. Remove the junction box from the air conditioner (para 4-36 *b*). Disconnect and tag the leads to contacts 2 and 3. Using an ohmmeter, measure the resistance across contacts 2 and 3 with the control circuit de-energized. Reading should indicate an open circuit. Energize the control circuit and again measure the resistance across contacts 2 and 3. The resistance should again be open circuit until the time period of 15 seconds for K9 or 30 seconds for K6 has elapsed. At the end of the timing period there should be a reading of zero ohms across terminals 2 and 3.

c. Removal. Tag and disconnect the remaining wire leads. Remove the two screws on the right back side of the junction box and the screw on the right end of the junction box to remove the bracket to which the time delay relays are mounted. Remove the time delay relays from the bracket by removing the four nuts and screws which secure them to the top and bottom surfaces of the bracket. Time delay relay K9 is mounted on the top surface and K6 on the bottom surface.

d. Installation. Installation shall be in the reverse order of removal.

4-41. Compressor and Heater Control Relay

a. Function. The compressor relay K1 is normally open and closes when the mode selector switch is moved to the COOL mode. When it closes

power is provided to the compressor power circuit. The heater control relay K2 is identical to the compressor relay. This relay controls the power to one of the two banks of three heating elements in the air conditioner.

b. Testing. Remove the junction box from the air conditioner (para 4-36 *b*). Tag and disconnect the leads to the relay. Use an ohmmeter and measure the resistance between contacts A1 to A2, B1 to B2 and C1 to C2. An open circuit should be indicated. Next apply 28 volts DC to coil terminals X1 and X2. A closed circuit should be indicated from A1 to A2, B1 to B2 and C1 to C2.

c. Removal. Remove the four nuts and screws which secure the contactor to the back panel of the junction box.

d. Installation. Installation shall be in the reverse order of removal.

4-42. Fuses

a. Function. There are two fuses included in the junction box. They serve to protect the control circuit from damage due to short circuits. Fuse F1 protects the primary side of the transformer and fuse F2 protects the low voltage control circuit.

b. Testing. Remove the junction box from the air conditioner (para 4-36 *b*). Remove the fuses from the fuseholders located inside the left end panel of the junction box. Measure the resistance across the fuse with an ohmmeter. The resistance should be approximately zero ohms.

c. Installation. Replace the fuses in their respective fuseholders. Make sure that the fuses are securely seated in the holder clips.

4-43. Supression Capacitor

a. Function. A radio frequency interference (RFI) suppression capacitor C3 is included in the control circuitry to reduce RFI noise generated by the rectifier.

b. Removal and Testing. Remove the junction box from the air conditioner (para 4-36 *b*). Tag and disconnect the leads to the output terminals X1 and X2 of the transformer and remove the capacitor from across these terminals. Apply 60 Hertz test voltage not exceeding 200 volts across the capacitor terminals. Measure the voltage across the capacitor and the amperage draw. The capacitance should be 1 microfarad ± 10 percent when calculated by the following formula: 2650 X Amperage divided by voltage.

c. Installation. Installation shall be in the reverse order of removal.

4-44. Mode Selector Switch

a. Function. The mode selector switch is used to select the mode of operation for the air conditioner. Modes available are OFF, VENTILATE, COOL, LOW HEAT and HIGH HEAT. For a description of each position of the switch, refer to table 2-1.

b. Testing. Remove the control panel from the air conditioner (para 4-36 *c*). Tag and disconnect the leads to the selector switch. Refer to the switch position table of figure 1-7 for the contact relationship in each mode position. Use an ohmmeter and measure the resistance between the related contacts at each switch setting. Contacts across terminals in the closed positions should read zero ohms and in the open positions should read infinite ohms.

c. Removal. Loosen the set screw in the knob with an 5 / 64 Hexagon Head wrench and remove the knob. Remove the nut, washer and lockwasher which secure the switch to the control panel and remove the switch.

d. Installation. Installation shall be in the reverse order of removal.

4-45. Temperature Control Thermostat

a. Function. This is an adjustable, single pole, double throw device that directs current to associated elements of the heating and cooling circuits of the air conditioner. It has an adjustable range from 40 to 70 degrees F. with a 1.75 degrees F. differential at any given setting. When the mode selector switch is positioned on the cooling mode the thermostat controls the action of the liquid line solenoid valve to reduce the cooling capacity when the return air temperature is below the setting of the thermostat. When the mode selector switch is positioned on either of the heating modes the thermostat controls the opening of the heater control relay. When the temperature rises above the setting of the thermostat it opens to open the relay and break the power circuit to one bank of heaters

b. Testing. Remove the control panel from the air conditioner (para 4-36 *c*). Tag and disconnect the leads to the thermostat. With the thermostat set below room temperature measure for continuity with an ohmmeter from terminal "R" to termina "BL". Resistance should be zero ohms. Move the setting to a position above room temperature. The resistance across terminals "R" and "BL" should be infinity indicating an open circuit.

c. Removal. Remove the four nuts and screws which secure the thermostat to the back plate of the control panel.

d. Installation. Installation shall be in the reverse order of removal.

4-46. Fan Speed Switch

a. Function. The fan speed switch is supplied to select operation of the fan motor on either low o high speed.

b. Testing. Remove the control panel from the air conditioner (para 4-36 *c*). Tag and disconnec the leads to the fan speed switch. Place the switcl in the LOW speed position. Using an ohmmeter high resistance should be read between contacts

and 2. Place the switch in the High speed position. Zero ohms should be read between contacts 1 and 2.

c. Removal. Remove the hexagon nut which secures the switch to the front of the control panel.

d. Installation. Installation shall be in the reverse order of removal.

4-47. Fan Motor and Compressor Motor Capacitors

a. Function. Two capacitors are incorporated in the electrical circuit to improve the power factor, reduce motor currents, supply the required starting torque for the fan and compressor motors and to improve the efficiency of the two motors. One run capacitor C2 is utilized to improve the compressor motor characteristics and the second capacitor C1 is utilized to improve the fan motor characteristics.

b. Removal. Remove the junction box from the air conditioner (para 4-36 *d*). Tag and disconnect the four leads to the two capacitors located behind the left side junction box mounting bracket. Remove the four screws located on the lower left outside panel of the air conditioner casing. Lift the capacitor and bracket assembly out of the air conditioner. Remove the two nuts and screws which secure the capacitor retaining strap to the mounting bracket and remove the capacitors.

c. Testing. A capacitor suspected of being defective should be inspected for cracks or external deformation. If a visual defect is observed the capacitor may be assumed to be defective. Shorted fuses or a tripped circuit breaker is an indication that a capacitor is shorted. A shorted run capacitor will also run hot. If the compressor or fan motor starts and runs but fails to carry the load or trips out the protector when not overloaded, an open running capacitor is indicated. Take an amp reading of the motor associated with a suspect capacitor with the capacitor both in and out of the circuit. If the current draw of the motor does not increase with the run capacitor out of the circuit, it indicates an open capacitor. The capacitance rating may be checked using the procedures specified in paragraph 4-43 *b*. Test voltage shall not exceed 370 volts for this test.

d. Installation. Installation shall be in the reverse order of removal.

4-48. Outside Air Thermostat

a. Function. The outside air thermostat is a normally open device which opens at 50° F. to prevent operation of the compressor below this temperature.

b. Testing. Remove the front access panel (para 4-12) and the junction box cover (para 4-36 *b*). Place the mode selector switch in the OFF position and using an ohmmeter measure for continuity across terminals 2 and 3 of terminal board TB2 in the junction box. If the temperature at the thermostat (located on the rear panel above the condenser coil) is above 50° F., the resistance should be very low. An open circuit (high resistance) indicates that the thermostat is defective.

c. Removal. Remove the two screws which secure the thermostat and gasket to the rear panel. Remove the junction box from the air conditioner (para 4-36 *b*). Remove electrical plug P4 from the left back of the junction box. Disconnect electrical connector P4 per paragraph 4-49. Unsolder only the two wires V8D16 and V9A16 which are an integral part of the outside air thermostat.

d. Installation. Installation shall be in the reverse order of removal.

4-49. Wiring Harness Repair

a. General. Six wiring harnesses are used in the air conditioner to distribute the control and electrical power supply. If a harness is severely damaged, it should be replaced. The procedures contained here provide for repair to minor damage.

b. Test and Inspection.

(1) Inspect the connectors for cracked or damaged shells and for bent pins.

(2) Inspect the harness wiring for broken wires and frayed or damaged insulation.

(3) Use an ohmmeter and check continuity of each wire from the pin of one connector to the corresponding pin of the other connector, (wiring diagram fig. 1-5). Ohmmeter should read approximately zero ohms.

(4) Check continuity between each pin and all other pins on all connectors. Infinite ohms should exist between all pins, unless connected as shown on wiring diagram.

c. Disassembly.

(1) Disassemble the connector to gain access to the wiring soldered to the connector pins.

(2) To remove a wire, unsolder it from the pins on each connector and pull the wire from the harness assembly.

(3) To remove a connector, unsolder all wires, one at a time, from the connector to be removed. Tag each wire as it is unsoldered.

d. Reassembly. Reassemble the connector shells in reverse order of removal. Be sure that the shell insulator is in place and not damaged.

4-50. Heating Elements

a. Function. There are two banks of three heating elements per bank. Their purpose is to provide heated air on demand. They are controlled by a relay and a selector switch. When the mode selector switch is placed in LO-HEAT position, one bank of three heating elements is energized; with the selector switch in HI-HEAT position, both banks of the heating elements are energized if the control thermostat is set above evaporator return air temperaure.

b. Testing. Refer to figure 1-5 and, using an ohmmeter, measure resistance between terminals A and B. Meter should read approximately 10 ohms. Next, measure resistance between heater terminals and casing. Must read open circuit ohms.

c. Removal.

(1) Remove the top panel (para 4-11).

(2) Remove the nuts and washers securing the wiring to the heating elements and tag and remove the wiring.

(3) Loosen the retaining screw and remove the clamp which secures the heater to the heater support bar.

(4) Lift the heating element out of the air conditioner.

d. Installation. Installation should be performed in reverse order of removal. Be sure that all wiring is reconnected properly and that all connections are tight. Keep wiring terminals oriented so that shorts do not occur across the heater terminals.

4-51. Heater Thermostat

a. Function. The heater thermostat protects the air conditioner from overheating when in the heating mode. It cuts off the power supply to all heating elements upon a rise to a temperature of 90±5° C. This situation should normally only occur in the absence of air flow across the heating elements.

b. Testing. Using an ohmmeter check for continuity between the three terminals of the thermostat. There should be zero resistance across each pair of terminals. Check for resistance from each of the terminals to the case of the air conditioner. Open circuit resistance should be indicated.

c. Removal.

(1) Remove the top panel (para 4-11).

(2) Tag and remove the three wire leads from the heater thermostat.

(3) Remove the two screws, nuts and washers which secure the heater thermostat to the support bar and remove the thermostat.

d. Installation. Installation shall be in the reverse order of removal.

4-52. Fan Speed Relay

a. Function. This relay is used to control the fan speed as selected by the fan speed switch on the control panel or the fan speed control pressure switch which closes upon an increase in refrigerant pressure. This relay is a four pole double throw type with four normally open contacts and four normally closed contacts.

b. Testing. Use an ohmmeter and measure resistance (should read zero ohms) between the associated normally closed contacts. The resistance between the normally open contacts should read infinity on the ohmmeter. Then apply minimum rated test voltage to relay coil. Contacts m reverse from open to closed as noted by a click noise. Finally, measure the contact resistance w the relay energized. The ohmmeter readings sho be infinite for the normally closed contacts and z ohms for the normally open contacts. Check resistance from each of the terminals to the cas the air conditioner. Open circuit resistance sho be indicated.

c. Removal.

(1) Remove the top panel (para 4-11).

(2) Tag and disconnect the ten wire lea

(3) Remove the two nuts, washers and scr and remove the relay.

d. Installation. Installation shall be in reverse order of removal.

4-53. Wiring Harnesses

a. Function. There are six wiring harne included in the air conditioner which serve distribute the power and control wiring to various electrical components included. In addi to these harnesses there are thirty-nine indivic electrical leads which are not integral to aforementioned harnesses. Two harnesses twenty-seven electrical leads are included in junction box assembly. One harness and tl electrical leads are included in the control p assembly. Three harnesses and nine electrical l are included in the air conditioner outside control panel and junction box.

b. Inspection and Test. Inspection and tes the wiring harnesses consists of visually chec for broken or cracked insulation, poor solder jc or loose terminal connections. Proper operatio the air conditioner in all modes of operation is best check of the various wiring harnesses. Ref figure numbers 1-5 and 1-7 in the event there malfunction in the operation of the air conditi for electrical check points. Use a multimete check for continuity from point to point an check for shorts between connections.

c. Removal.

(1) *Power Distribution Wiring H..ness.*

(a) Remove the junction box (para 4-

(b) Remove the top panel (para 4-11

(c) Remove the four slip-on conne from capacitors C1 and C2. Tag the wires b disconnecting.

(d) Disconnect P7 from connector J7 o top portion of the evaporator / condenser parti P3 from connector J3 on the compressor and from J10 on the junction box.

(e) Remove the two screws, spacers clamps which secure the harness to the c assembly, and carefully remove the harness.

(2) *Heater Wiring Harness.*

(a) Remove the top panel (para 4-11

(b) Remove connector P7 from J7,

remove four nuts and screws securing connector J7 to the case.

(c) Tag and disconnect the two wire leads to heater numbers 2 and 5.

(d) Tag and disconnect the two wire leads from the heater thermostat to heater numbers 2 and 5.

(e) Remove the two screws, nuts and washers which secure the heater thermostat to the heater support bar and remove the thermostat and connector J7.

(3) *Wiring Harness.*

(a) Remove the junction box (para 4-36).

(b) Remove the top panel (para 4-11).

(c) Remove the four screws which secure connector J1 to the back of the case assembly. Remove the gasket and cap from J1.

(d) Remove the solenoid valve coil from solenoid valves L1 and L2. The coils may be removed by loosening the hexagon nut at the top and carefully lifting the coil assembly from around the plunger assembly.

(e) Remove connector P4 from J4 on the junction box.

(f) Unsolder leads from fan speed control pressure switch S8 to connector P4 (Pin numbers *f* and *g*).

(g) Remove the two screws which secure the outside air thermostat to the back of the casing.

(h) Remove the ten slip-on connectors from fan speed relay K7.

(i) Remove the four screws securing the pressure switch enclosure to the inside rear of the casing. Remove the grommet from the pressure switch enclosure and tag and remove the two harness leads from the low and high pressure cut out switches.

(j) Disconnect connectors P2 from J2 on the fan motor and P8 from J8 on the control panel.

(k) Remove the two screws, spacers and clamps which secure the harness to the casing assembly.

(4) *Junction Box Wiring Harness, J10.*

(a) Remove the junction box (para 4-36).

(b) Tag the ten wire leads from connector J10 and disconnect six leads from terminal board TB1, two leads from terminal board TB2 and one lead from relay K1 and relay K2.

(c) Remove the four nuts and screws which secure connector J10 to the back of the junction box and remove the harness.

(5) *Junction Box Wiring Harness, J4.*

(a) Remove the junction box (para 4-36).

(b) Tag the twenty-four wire leads from connector J4 and disconnect ten leads from terminal board TB2, eight leads from terminal board TB1, one lead from relay K1, one lead from relay K2, one lead from the circuit breaker, two leads from ground lug E2 and one lead from fuse block XF2.

(c) Remove the four nuts and screws which secure connector J4 to the back of the junction box and remove the harness.

(6) *Control Panel Wiring Harness.*

(a) Remove the junction box and open the control panel for servicing (para 4-36).

(b) Tag the eleven wire leads from connector J8 and disconnect seven leads from the mode selector switch, two leads from the fan speed switch, one lead from the temperature control thermostat and one lead from ground lug E1.

(c) Remove the four screws, washers and lockwashers which secure connector J8 to the side of the control panel and remove the harness.

d. Installation. Installation of the wiring harnesses shall be in the reverse order of removal. Care shall be taken while installing the harnesses to insure that the cable is not crimped or damaged or placed under stress. Be sure that there is no interference with moving parts and that the harnesses are securely clamped and secured to prevent mechanical damage.

Section XIII. MAINTENANCE OF THE REFRIGERANT SYSTEM

4-54. General

Maintenance of the refrigerant system is limited to inspection and test for proper operation of the functional components and cleaning of the condenser and evaporator coils. The refrigerant system consists of the condenser and evaporator coils, compressor, expansion valves, solenoid valves, pressure switches, pressure relief valve, dehydrator, sight glass, service valves, fluid pressure regulator and the associated interconnecting piping. Refer to figure 1-6 for the schematic refrigeration flow diagram.

4-55. Refrigerant System Service

a. General. In the event a low refrigerant charge is suspected (para 4-57) the system should be checked for leaks as specified in paragraph *b*(1) and paragraph *b*(2). Any leaks discovered should be reported to DS Maintenance for correction.

b. Testing for Leaks. Use of the halide torch detector is the preferred method of testing for leaks in the refrigerant system if an electronic halogen tester is not available. Pass the exploring tube slowly over all sweat fittings, mechanical couplings and valves. If refrigerant is leaking from the

system, the flame of the halide torch will change from blue to green when the leak is small. If the leak is large, the flame will be dense blue with a reddish tip; or a large leak may extinguish the torch. Mark all spots where leaks are noticed.

4-56. Pressure Switches

a. General. The air conditioner is equipped with three pressure switches. Low pressure cutout S6 is provided to prevent harmful effects due to extremely low refrigerant pressure. It is set to open at 25 ± 10 PSIG. High pressure cutout S5 is provided to prevent harmful effects due to extremely high refrigerant pressure. It is set to open at 460 ± 10 PSIG. Switches S5 and S6 are wired in series with the compressor control circuit and automatically deenergize this circuit upon opening. S5 and S6 must be reset manually by depressing the reset buttons located at the top rear of the air conditioner. The switches are found in a metal enclosure located in the top rear section of the air conditioner. Pressure switch S8 is provided to switch the fan motor from Low to High speed when the refrigerant pressure reaches 405 ± 17 PSIG. When the pressure drops to 285 ± 17 PSIG the switch opens and the fan motor automatically goes from High to Low speed. This switch is located in the discharge refrigerant line close to the fan motor.

b. Test of Pressure Switches S5 and S6.

(1) Remove the top panel (para. 4-11).

(2) Remove the four screws which secure the pressure switch enclosure to the rear panel and remove the enclosure.

(3) Using a multimeter check for continuity from terminal 1 of S6 to terminal 2 of S5. Continuity should exist if the pressures are in the range from 25 to 460 PSIG.

(4) Check the capillary tubes leading to the two pressure switches for kinks or breaks.

4-57. Sight Glass

a. General. The sight glass provides a means of determining the moisture content and adequacy of the refrigerant charge of the system. The sight glass is located in the top rear of the air conditioner.

b. Inspection.

(1) *Moisture content.* The center disc of the glass is green when the refrigerant system is dry. A chartreuse color indicates that some moisture is present and continuous observation should be made for increase in moisture content. A definite yellow color indicates the presence of excessive moisture in the system. The air conditioner should be taken out of service immediately and referred to DS Maintenance for correction.

(2) *Refrigerant charge.* The presence of a clear sight glass when the air conditioner is on the cooling cycle indicates that there is an adequate charge of refrigerant. The presence of bubbles or foam in the glass indicates a shortage of refrigerant which should be referred to DS Maintenance for correction. Bubbles and foaming will occur upon initial start-up and following change-over between the cooling and by-pass cycles of operation so that observation for a clear sight glass should be made after stable operation has been established.

4-58. Compressor

a. General. The function of the compressor is to deliver refrigerant to the condenser coil at a pressure and temperature at which the condensing process can readily be accomplished. The compressor raises the pressure of the refrigerant suction gas to the condensing discharge pressure.

b. Inspection. Inspection of the compressor includes checking for refrigerant leaks particularly where the suction, pre-cooler and discharge lines enter and leave the compressor. Inspect the pre-cooler coil for dents, cracks or other damage. When inspection of the compressor is accomplished, the compressor mounts should be inspected for secure mounting. The four nuts which fasten the compressor to the base panel of the air conditioner should be tightened securely. The eight rubber resilient mounts located at the top and bottom of each of the four holes in the base panel under the compressor feet should be inspected to insure that there is no undue deterioration. Defective rubber resilient mounts should be reported to GS Maintenance for replacement.

c. Test. Test of the compressor consists of observation for normal operating pressures under cooling load, normal running current and measurement of the winding and winding insulation resistance of the internal motor. Insulation resistance between the windings and the compressor frame should be not less than 60 megohms. The main winding (terminal pin A to C) should range between .6 to .8 ohms and the auxiliary winding (terminal pin A to pin B) should be between 5 and 7 ohms. The current and pressure should be as shown in Table 4.3.

Table 4-3. Normal Operating Pressures and Currents.

Outdoor Ambient Temperature— °F Db	120° F (48.9 C)	95° F (35° C)
Return Air to Unit— °F Db and Wb	90° F Db (32.2 C) 75° F Wb (24° C)	80° F Db (26.7 C) 67° F Wb (19° C)
Gage Pressure		
Suction—PSIG	75—90	60—70
Discharge—PSIG	360—380	260—270
Current—Amperes	11—13	9—11

Note: Db (Dry bulb)
Wb (Wet bulb)

4-59. Solenoid Valves

Two solenoid valves are used in the air conditioner. Both are normally open valves. L1 (fig. 1-6 is the liquid line solenoid valve. It is controlled by the thermostat setting. Whenever the intake air temperature reaches the setting of the thermostat the electrical circuit to the L1 solenoid is energized thus closing the valve to stop the flow of refrigerant through the evaporator coil. When the temperature rises, the valve is de-energized and thus opens permitting liquid refrigerant flow to the evaporator to resume cooling. The L2 solenoid valve (fig. 1-6) is the compressor by-pass solenoid and is piped in parallel with the compressor. When the compressor stops the valve de-energizes and assumes its normally open position thus allowing pressure to equalize from the discharge to the suction side of the compressor. To determine if L1 is functioning properly, observe the sight glass and if flow is noted, valve is open. Adjust thermostat to the higher setting and flow should stop. Check L2 by removing the top panel of the unit and feeling the line out of the valve. If line is warm, valve is not closing when energized. Check coil of both valves for continuity and ground by using an ohmmeter. It should read a resistance of 50 ohms, approximately.

4-60. Suction and Discharge Service Valves

The air conditioner is equipped with a suction and a discharge service valve (fig. 1-2) located behind an access panel next to the CBR duct cover at the rear of the air conditioner. Test of the service valves consists of checking to insure that they do not leak. (para 4-55). Be sure that the caps are securely fastened to the service valve openings.

4-61. Suction Strainer

The suction strainer is an integral part of the compressor. It serves to prevent large contaminants (particles measuring greater than 5 microns) from entering the compressor. Service is normally not required for the suction strainer. The only inspection being, checking for refrigerant leaks particularly at the inlet and outlet suction line connections (para 4-55). A clogged suction strainer would result in excessively low suction pressure (para 4-58). Severe clogging of the strainer could be evidenced by frost forming on the exterior surfaces.

4-62. Thermostatic Expansion Valves

a. General. Two thermostatic expansion valves are used in the air conditioner. One expansion valve controls the rate of flow of liquid refrigerant into the evaporator coil during the cooling cycle of operation. The second expansion valve functions when the unit is in the by-pass cycle of operation. Each valve is equipped with a super heat setting or adjustment, 10° F. for the main valve and 25° F. for the by-pass valve to assume efficiency in the refrigerant system. The adjustment procedures may be applied to either or both expansion valves. Adjust only when absolutely necessary and then only during the cooling cycle.

b. Adjustment.

(1) Tape the bulb of a thermometer to the suction tube near the sensing element. Insulate the thermometer bulb.

(2) Install a suitable pressure gage at suction service valve.

(3) Operate the unit for approximately 30 minutes or until thermometer reading stablizes.

(4) Check thermometer and pressure gage readings. Compare readings with figure 4-2. Thermometer reading should be approximately 10° F. for the valve feeding the evaporator coil and 25° F for the bypass valve, higher than the saturated refrigerant temperature.

(5) Remove cap from side of valve. If tem-

perature reading is high, turn adjusting screw counter-clockwise approximately one turn for each 4° F. that temperature is high. If temperature reading is low turn adjusting screw clockwise approximately one turn for each 4° F. that temperature is low. Install cap on side of valve when adjustment is completed. Remove gage and thermometer.

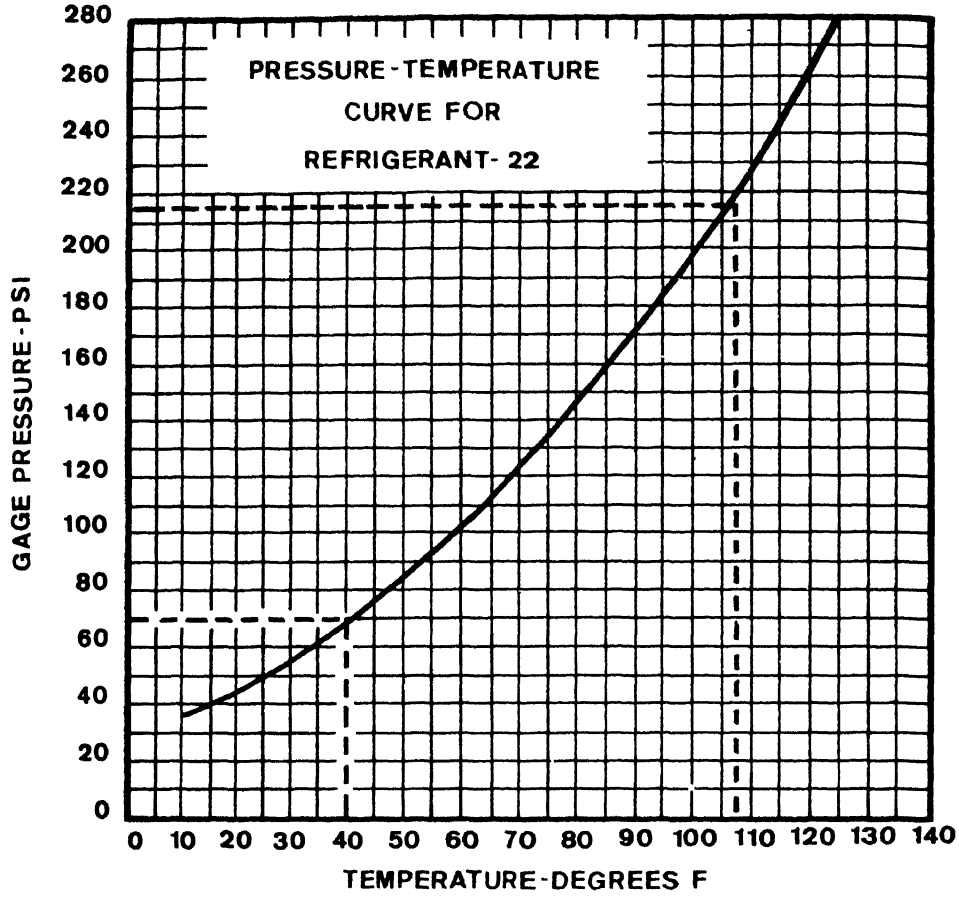


Figure 4-2. Refrigerant 22 pressure-temperature chart.

4-63. Pressure Relief Valve

The pressure relief valve is a safety device used to relieve refrigerant pressure if it attempts to go higher than the system is designed to withstand. Proper relief pressure is 540 PSIG. The only inspection required for this device is to insure that the valve or its connection to the tubing is not leaking (para 4-55).

4-64. Fluid Pressure Regulator

The pressure regulator valve is incorporated in the refrigerant system to regulate pressure on the suction side of the system and maintain it a minimum of 30 PSIG at all times the air conditioner is operating on the cooling cycle. To check the valve, install a gage on the suction service valve and increase the control thermostat setting until the liquid line solenoid valve closes. This will lower the suction pressure. The fluid pressure regulator is factory set and sealed at 58 PSIG.

4-65. Dehydrator

The dehydrator is a filter and moisture drier for the refrigerant system. When the sight glass indicates that moisture is present in the system (para 4-57), it should be reported to DS Maintenance for correction.

4-66. Evaporator Coil

a. Inspection and Test. Inspection and test of the evaporator coil consists of examination for bent

fins and accumulation of external contamination and test for refrigerant leaks (para 4-55).

b. Service. Scrub the external portion of the coil with a stiff bristle brush or soft bristle wire brush to remove scale and corrosion. Take care not to damage the fins. Use compressed air to blow out loose material. Wipe the coil with a cloth dampened with dry cleaning solvent per Federal Specification P-S-661. Bent fins may be straightened with a fin comb (12 fins per inch spacing) or with needle nose pliers.

4-67. Condenser Coil

a. Inspection and Test. Inspection and test of the condensor coil consists of examination for bent fins and accumulation of external contamination and test for refrigerant leaks (para 4-55).

b. Service. Scrub the external portion of the coil with a stiff bristle brush or a soft bristle wire brush to remove scale and corrosion. Take care not to damage the fins. Use compressed air to blow out loose material. Wipe the coil with a cloth dampened with dry cleaning solvent per Federal Specification P-S-661. Bent fins may be straightened with a fin comb (15 fins per inch spacing) or with needle nose pliers.

CHAPTER 5

DIRECT SUPPORT AND GENERAL SUPPORT

MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, SPECIAL TOOLS, AND EQUIPMENT

5-1. Tools and Equipment

No tools and equipment are issued to direct and general support maintenance for use in maintenance of the air conditioner.

5-2. Special Tools and Equipment

No special tools are equipment are required.

5-3. Maintenance Repair Parts

Repaired parts and equipment are listed and illustrated in the repair parts and special tools list covered direct and general support maintenance for this air conditioner.

Section II. TROUBLESHOOTING

5-4. General

This section contains troubleshooting for locating and correcting most of the operating troubles which may develop in the air conditioner. Each malfunction for an individual component, unit, or system is followed by a list of tests or inspections which will help you to determine probable causes and corrective actions to take. You should perform the tests / inspections and corrective actions in the order listed.

Table 5-1. Troubleshooting

Malfunction	Probable Cause	Corrective Action
1. Fan motor runs at low speed only.	Fan speed control pressure switch defective.	Replace fan speed control pressure switch (para 5-14).
2. Compressor will not start. Fan Motor runs correctly.	*a.* Defective compressor.	*a.* Replace compressor (para 5-22).
	b. Defective high or low pressure output.	*b.* Replace high or low pressure cut-out (para 5-15).
	c. Defective compressor thermal overload.	*c.* Replace compressor (para 5-22).
	d. Extremely low refrigerant charge.	*d.* Charge the air conditioner with the correct amount of refrigerant (para 5-8).
3. Compressor starts but cycles on thermal overload. Fan motor runs correctly.	*a.* Excessive refrigerant charge.	*a.* Charge the air conditioner with the correct amount of refrigerant (para 5-8).
	b. Air or other non-condensibles in refrigeration system.	*b.* Evacuate system and re-charge with the correct amount of refrigerant (para 5-8).
	c. Compressor by-pass solenoid valve will not close to stop refrigerant flow in cooling mode.	*c.* Replace defective by-pass solenoid valve (para 5-17).
	d. Fluid pressure regulator set too high or defective.	*d.* Lower setting of fluid pressure regulator to not greater than 58 psig. Replace defective fluid pressure regulator (para 5-19).
	e. Defective compressor.	*e.* Replace compressor (para 5-22).
	f. Moisture in refrigeration system.	*f.* Evacuate system and re-charge with correct amount of refrigerant (para 5-8).
	g. Superheat setting of evaporator expansion valve or bypass expansion valve set too low.	*g.* Raise superheat setting (para 4-62).
	h. Defective evaporator expansion valve or bypass expansion valve.	*h.* Replace defective valve (para 5-18).

Table 5-1. Troubleshooting—Continued

Malfunction	Probable Cause	Corrective Action
4. Little or no cooling. Compressor and fan motor run.	*a.* Insufficient charge of refrigerant.	*a.* Charge the air conditioner with the correct amount of refrigerant (para 5-8).
	b. Defective evaporator expansion valve, dehydrator, fluid pressure regulator, liquid line solenoid valve, compressor bypass solenoid valve, bypass expansion valve or compressor.	*b.* Replace defective component (para 5-13, 5-17, 5-18, 5-19, or 5-22).
	c. Excessive refrigerant charge.	*c.* Charge the air conditioner with the correct amount of refrigerant (para 5-8).
	d. Improper setting of fluid pressure regulator.	*d.* Lower setting if suction pressure is high or raise the setting if the suction is too low (para 5-19).
	e. Improper setting of the superheat for the evaporator expansion valve or the bypass expansion valve.	*e.* Lower the setting if the suction pressure is too low and raise the setting if the superheat is too low. (para 4-62).
	f. External equalizer line of the evaporator expansion valve kinked or obstructed.	*f.* Replace the external equalizer line (para 5-9).
	g. Air or other non-condensibles or moisture in the refrigeration system.	*g.* Evacuate the system and re-charge with the correct amount of refrigerant (para 5-8).
5. Compressor cycles off.	Defective compressor thermal overload protector.	Replace compressor (para 5-22).
6. High pressure cutout trips excessively.	*a.* Defective high pressure cutout.	*a.* Replace high pressure cutout (para 5-15).
	b. Excessive refrigerant charge.	*b.* Charge the air conditioner with the correct amount of refrigerant (para 5-8).
	c. Air or other non-condensibles in refrigeration system.	*c.* Evacuate the system and re-charge with the correct amount of refrigerant (para 5-8).
7. Low pressure cutout trips excessively.	*a.* Defective low pressure cutout.	*a.* Replace low pressure cutout (para 5-15).
	b. Low refrigerant charge.	*b.* Charge the air conditioner with the correct amount of refrigerant (para 5-8).
	c. Dehydrator clogged with contaminants.	*c.* Replace dehydrator (para 5-13).
	d. Superheat set too high on evaporator expansion valve on bypass expansion valve.	*d.* Lower superheat setting (para 4-62).
	e. Fluid pressure regulator set too low.	*e.* Raise setting of fluid pressure regulator (para 5-19).
	f. Defective evaporator expansion valve, fluid pressure regulator, liquid line solenoid or bypass expansion valve.	*f.* Replace defective component (para 5-17, 5-18 or 5-19).
8. Air conditioner noisy.	*a.* Noisy fan motor from worn bearings.	*a.* Replace fan motor (para 4-34).
	b. Defective compressor.	*b.* Replace compressor (para 5-22).
	c. Liquid slugging of the compressor.	*c.* Replace defective evaporator expansion valve or bypass expansion valve (para 5-18). Insure that remote bulbs of these valves are securely fastened to the suction line and properly insulated. Raise the superheat settings to prevent liquid carry over (para 4-62).

5-5. Malfunctions Not Listed

This manual cannot list all the malfunctions that may occur nor all the tests or inspections and corrective actions. If a malfunction is not listed in table 5-1 or is not corrected by listed corrective actions, notify your supervisor.

Section III. GENERAL MAINTENANCE

5-6. Cooling Cycle of Operation

a. General. The fan motor and compressor run continuously, whether the temperature control is calling for cooling or not, when the unit is adjusted to operate on the cooling cycle of operation. This feature provides a constant electrical load, which prevents voltage fluctuations within the system.

b. By-pass Cycle of Operation. When the conditioned air temperature falls below the temperature control setting, the circuit, which controls the solenoid valve, is energized causing the liquid line solenoid valve to close. This stops the flow of liquid refrigerant to the evaporator coil. This stops the cooling function completely, and by-passes a small amount of liquid refrigerant into the suction line through a thermostatic expansion valve. Suction pressure is maintained by hot gas by-pass through the fluid pressure regulator.

5-7. Refrigerant Charge Checks

a. Operate unit continuously for a minimum of 30 minutes.

b. While unit is operating, observe the sight glass.

c. If refrigerant passing through sight glass is clear and cooling is being produced, it may be assumed that the refrigerant system is adquately charged.

d. If the refrigerant passing through the sight glass contains bubbles or appears milky, the system may require additional refrigerant.

5-8. Refrigerant System Servicing

a. Testing for Leaks.

(1) *Halide torch detector.* This is the preferred method of testing for leaks in the refrigerant system if an electronic halogen tester is not available. Pass the exploring tube slowly over all sweat fittings, mechanical couplings and valves. If refrigerant is leaking from the system, the flame of the halide torch will change from blue to green when the leak is small. If the leak is large, the flame will be dense blue with a reddish tip; or a large leak may extinguish the torch. Mark all spots where leaks are noticed. Discharge system (*b* below), repair any leaks and pressure test (*d* below).

(2) *Soap solution method.* Brush all possible points of leakage with soap solution, and watch for soap bubbles. Follow a definite sequence so all points will be thoroughly tested. Wipe the soap solution from all joints and mark any spot where a leak occurs. Discharge the refrigerant system (*b* below).

b. Discharging Refrigerant System.

NOTE

Air conditioner is equipped with two service valves located behind a panel at the back of the unit. These valves contain an integral pin which must be depressed to open the valve. Consequently the service hose connectors must contain a valve depressor in order to open the air conditioner service valve when connected.

(1) Remove two screws and remove the access cover for access to service valves.

NOTE

Make certain tank is of suitable construction and capacity to hold refrigerant charge from unit. Salvage of refrigerant is only recommended when new refrigerant is not available. Use a clean dehydrator when recharging used refrigerant back into the system.

(2) Connect a service hose securely to the empty refrigerant tank. Remove cap and connect other end of hose to the discharge line service valve. Loosen hose connection at the tank momentarily to purge air from hose.

WARNING

Avoid bodily contact with liquid refrigerant and avoid inhaling of refrigerant gas. Be careful that Refrigerant-22 does not contact the eyes. In case of refrigerant leaks, ventilate area immediately.

(3) Open tank valve and operate unit on cooling cycle to pump out refrigerant.

(4) Stop the unit. Close tank valve and disconnect hose from service valve and replace cap.

(5) Replace access cover.

c. Purging of Contaminated Refrigerant.

(1) Remove two screws and remove the access cover.

(2) Prepare to attach a suitable discharge line to the service valve with other end of the hose in a safe area.

(3) Connect the hose and discharge contaminated refrigerant.

(4) Install access cover.

WARNING

Avoid bodily contact with liquid refrigerant and avoid inhaling of

refrigerant gas. Be careful that Refrigerant-22 does not contact the eyes. In case of refrigerant leaks, ventilate area immediately.

d. Pressure Testing and Evacuating.

(1) The two service valves are located behind the access cover at the back of the unit. Remove the access cover.

(2) Refer to figure 5-1 and make up a charging hookup as shown.

(3) Remove cap from suction line service valve and connect the charging hookup to the service valve.

(4) Open shutoff valve to full open.

NOTE

Refrigerant drum must be in upright position to allow only gaseous refrigerant to enter system.

(5) Add refrigerant, until system pressure gage reads 50 PSIG (Pounds per square inch gage) minimum. Close the drum shutoff valve.

(6) Disconnect charging hookup and connect the pressure testing hookup (fig. 5-2) to the suction line service valve.

(7) Open the shutoff valve to full open.

(8) Add nitrogen and adjust pressure regulator until drum pressure gage reads 150 PSIG. Close the drum shutoff valve.

(9) Test system for leaks (para 5-8 *a*).

(10) If no leaks are detected, disconnect the pressure testing hookup. Connect a suitable hose to the discharge line service valve to allow test gases to escape.

(11) Remove cap from discharge line service valve. Attach a suitable vacuum pump to discharge line service valve and a manometer to suction line service valve. With the service valves open, operate vacuum pump until manometer indicates 2.5 mm (millimeters).

(12) Close valve at vacuum pump and stop pump. Allow unit to stand under vacuum for one hour. If no noticeable rise in pressure occurs, the system is ready for charging. Disconnect manometer from suction line service valve and connect the refrigerant charging hookup to this valve. Operate vacuum pump for another thirty (30) minutes. Close vacuum pump valve and stop pump.

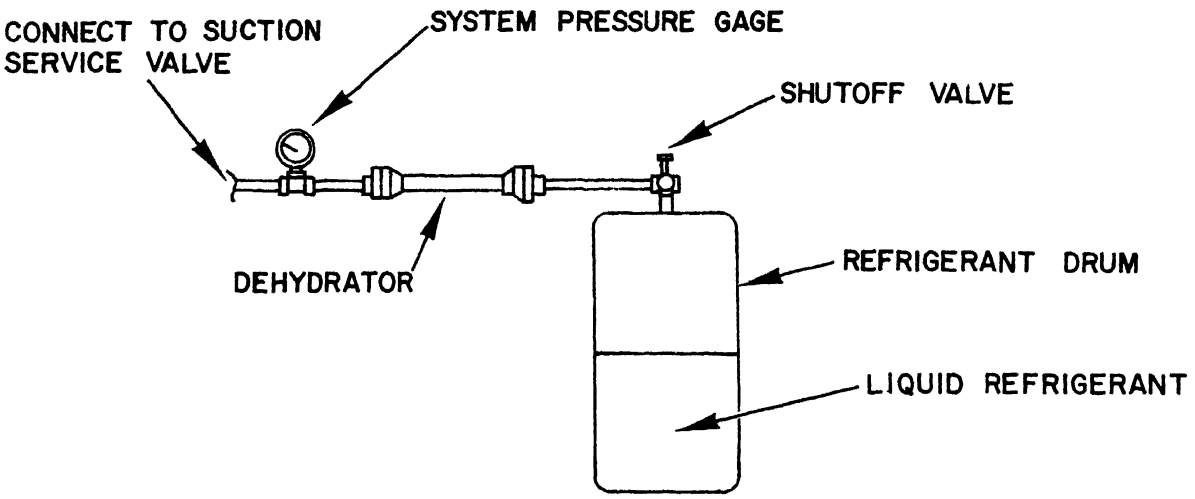


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Figure 5-1. Refrigerant charging hook up.

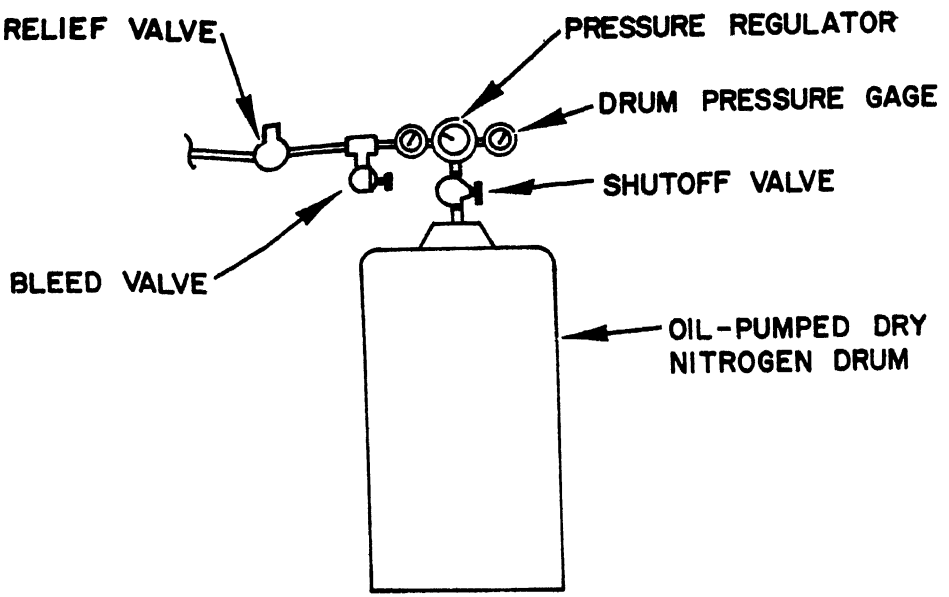

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Figure 5-2. Refrigerant pressure testing hook up.

e. Charging the System.

(1) Refer to figure 5-1 showing the refrigerant charging hookup. Install pressure gages before attempting to charge the system. Open the refrigerant drum valve to put a positive pressure in the system.

(2) Disconnect the vacuum pump from the discharge line service valve and connect a suitable pressure gage to this valve.

(3) Set refrigerant drum in upright position so that only gaseous refrigerant will enter system. To speed up charging, set refrigerant drum in warm water. Never use a heating torch for this purpose.

(4) Set temperature control switch above ambient or room temperature. Open refrigerant drum shutoff valve. Operate unit in the cool position and weigh in 39 oz. charge of refrigerant-22. Continue adding refrigerant slowly until sight glass indicates full.

(5) Operate unit in cool position only during servicing operation.

(6) Partially block discharge grille with a cardboard baffle. Adjust baffle until suction pressure gage reads 55 PSIG. Continue adding refrigerant slowly, while maintaining 55 PSIG suction pressure by adjusting the baffle, until the discharge pressure gage reading corresponds to the ambient temperature. Close refrigerant drum shutoff valve. Stop the unit. Disconnect charging and gage hoses from services valves and install caps.

5-9. Tubes and Fittings

WARNING

Before removing any components from the refrigerant fluid system, the Refrigerant-22 must be discharged.

CAUTION

If the refrigerant system has been open to the atmosphere for any length of time due to tube breakage or other reasons, replace the dehydrator.

a. The refrigerant tubes used on the air conditioner consist of copper tubing and the necessary fittings. Joints of refrigerant tubes are soldered. Inspect the tubes and tubing for cracks and breaks. Replace defective tubes with those of the same length, size, shape and material. When removing or installing solenoid valves or expansion valves refer to the applicable paragraph and disassemble the unit before applying heat in the vicinity of the valves. If too much heat is transferred to the internal mechanism of the valves, damage will result.

b. When a tube or fitting has been soldered into the system it should be checked for leaks and the system serviced (para 5-8). Always replace holding clamps, insulation and rubber grommets where they were removed or damaged from excessive heat.

c. Flare nuts should be tightened securely when they are being installed on components that were removed. Flare nut connections should also be checked for leaks.

NOTE

If the refrigerant system has been open to the atmosphere for any length of time, due to the tube breakage or component replacement, replace the dehydrator. Pressure test and evacuate the system before charging.

5-10. Analysis of Operation (Electrical System)

a. General. The electrical system helps provide control for the air conditioning system, drives the compressor and circulating fans and provides the heat for the heating mode of operation. The heart of the electrical control system is the control panel where a selector switch, thermostatic control and toggle switch are used to manually select the various modes and conditions of operation. Four basic modes of operation are available.

b. Cooling Cycle. The selector switch, when placed in the cooling mode, provides power to a control voltage transformer. This transformer reduces the 115 volt power to a safe 30 volts. The reduced ac voltage is rectified to a pulsating dc and used to operate the system control circuits. The control voltage operates relays and solenoids, which in turn connects the power voltage to the compressor motor and to the fan motor. The toggle switch on the control panel controls the speed of the two speed fan motor (when S-7 is open).

c. Ventilating Cycle. In the ventilating cycle of operation, the control voltage is switched off from certain relays and solenoids which de-activates both the refrigerant and heating circuits. The fan motor circuit is kept energized in this mode and may be operated in either low speed or high speed.

d. Low Heat Cycle. In the low heat mode of operation, the selector switch energizes a set of heaters with the single phase power. The heat is distributed with the fan motor in either low speed or high speed operation.

e. High Heat Cycle. In the high heat mode of operation, a second set of heaters is controlled by a thermostatically controlled relay. The second set of heaters is identical to the set used in the low heat cycle; thus providing twice the low heat wattage output in the high heat mode.

f. Electrical System Protection. Several protection devices are included in the electrical system to protect against overloads and overheating.

(1) One 2 amp fuse is installed in the primary voltage line to the control voltage transformer and protects the control voltage transformer and rectifier from overload.

(2) One five amp fuse is installed in the dc control voltage line. This fuse protects the control relays and components from overload.

(3) Thermal protectors are included on the compressor motor and on the fan motor to protect the motors and input circuits from overload and overheating.

(4) A thermal protector is included in the heater circuit and installed near the heaters to protect them from failure in the event of overheating from failure of air flow.

(5) A high and a low pressure safety cutout turns off the cooling operation in the event of high or low pressure in the refrigerant system. The cutouts operated from the refrigerant system pressure, control the voltage to the electrical control circuits.

(6) A circuit breaker, in the two power lines to the compressor, with an auxiliary switch in the primary line to the control voltage, provides for protection against compressor overloads. In the event of compressor overload, the circuit breaker trips, opening both the two lines to the compressor and the control circuit.

(7) A pressure switch operated by the refrigerant system discharge pressure by-passes the fan speed toggle switch during high temperature cooling operation to automatically switch the fan to high speed operation. The fan automatically switches to low speed upon a drop in pressure.

(8) A time delay relay prevents simultaneous compressor motor and fan motor start-up. When the selector switch is placed in the cool position the compressor motor starts 15 seconds after the fan motor.

(9) A time delay relay prevents the fan motor from starting directly on high speed. The time delay of 15 seconds allows the fan motor to attain low speed RPM before switching to high speed.

5-11. Malfunction Isolation Procedure

a. General. When malfunctions occur in the air conditioner procedures are provided to aid the technician in locating the faulty component. The procedures are designed around the three primary functions that the air conditioner accomplishes: air flow, cooling or heating.

b. Air Low. Air flow directly affects cooling or heating and in the event of any type failure the air flow should be checked first.

(1) Place the selector switch in the VENTILATE position and check for air flow by feel and listening for fan motor operation.

(2) If motor operates but flow is insufficient, check grille louver position, check filters and screens for cleanliness, then check fan blades for looseness.

(3) If fan motor fails to operate at low speed, with HI-LO switch in the LO position and the selector switch contacts S / W2; 2 to B, relay K7, contacts 4 to 5 and 7 to 8, circuit breaker CB contacts B1 to B2 and the fan motor thermal protector for continuity. Check capacitor C1 to insure that is not defective.

(4) Place HI-LO switch in the HI position. If fan motor fails to operate at high speed in the ventilate mode, check the following components.

(a) Circuit breaker auxiliary switch; continuity from C to N. O.

(b) Fuses F1 and F2; continuity.

(c) Selector switch: continuity from S / W2, to B.

(d) Toggle switch S7: continuity.

(e) Time delay relay K9: continuity from 2 to 3.

(f) Fan speed relay K7: continuity from 15 to 16, 3 to 4 and 6 to 7.

(g) Fan motor thermal protector: continuity.

(h) Check for 30 volts AC output from transformer T.

(i) Check for 24 volts DC output from rectifier CR.

(j) Check capacitor C1.

(5) If all control components appear to be functioning properly and the fan motor fails to operate or operates improperly check the fan motor windings for continuity, shorts and proper voltage.

c. Cooling. Proper refrigerant charge, compressor operation and air flow are the three basic requirements for cooling operation. Check air flow as outlined in Para. b above.

(1) Place the selector switch in the COOL position, and rotate thermostat to extreme decrease position. Wait for five minutes then check air flow for coolness and listen for compressor operation.

(2) If compressor operates but cooling is insufficient, check refrigerant through sight glass.

(3) If compressor fails to operate, check voltage on load side of circuit breaker then check same voltage on load side of K1 contact.

(4) Check temperature control thermostat. Reset pressure switches S6 and S5. Measure continuity across pressure switch contacts.

(5) Check relay coil K6 and its time delay contacts. Check relay coil K1 and solenoid valves L1 and L2.

d. Heating. Heat from the heaters and air flow are the two basic requirements for heating operation. Check air flow as outlined in paragraph 5-11 *b* above.

(1) Place the selector switch in the LO-HEAT position and the temperature control in the extreme clockwise position. Wait for five minutes then check air flow for heat.

(2) Measure continuity across selector switch contacts S / W1, 2 to A and S / W2, 2 to B. Check thermal protector S3.

(3) Measure for continuity across circuit breaker contacts B1 and B2.

(4) Place selector switch in HI-HEAT position and check second set of heaters operation.

(5) Measure for continuity across selector switch contacts S / W3, 2 to A, S / W2, 2 to B and S / W1, 2 to A.

(6) Measure continuity and resistance to ground across each heater to isolate a particular heater that is malfunctioning.

(7) Check for continuity across thermostat S1, contacts R to BL.

(8) Check voltage across relay coil K2 and for continuity across its contacts A1 to A2.

Section IV. REMOVAL AND INSTALLATION OF MAJOR COMPONENTS

5-12. General

This section provides instructions for the removal and installation of major components for the air conditioner. Removal instructions for other components are contained in Chapter 4 of this manual. The procedures included in this section are presented in logical order for complete disassembly of the air conditioner.

WARNING

Before removing any components from the air conditioner, care must be taken to disconnect the input power to the unit. This will insure the safety of personnel and prevent damage to the air conditioner.

WARNING

Refrigerant system must be discharged before opening refrigerant circuit (para 5-8b).

5-13. Dehydrator

a. Removal.

(1) Discharge the refrigerant system (para 5-8 *b*).

(2) Remove two screws and remove the front access panel.

(3) Remove junction box assembly (para 4-36).

(4) Remove flare nuts from each end of the dehydrator.

(5) Remove screw and clamp holding the dehydrator and remove the dehydrator from its mounting bracket.

b. Installation. Installation of the dehydrator shall be in reverse order of removal. Always install a new dehydrator when the system has been opened to the atmosphere. Insure that the dehydrator is installed with the outlet toward the sight glass. The dehydrator is marked with an arrow showing the direction of flow. Evacuate and recharge the refrigerant system (para 5-8 *d* and para 5-8 *e*).

5-14. Fan Speed Pressure Switch S8

a. Removal.

(1) Discharge the refrigerant system (para 5-8 *b*).

(2) Remove the two screws securing the lower front panel and remove the panel.

(3) Remove junction box assembly (para 4-36).

(4) Remove fifteen screws and remove top panel.

(5) Discharge the refrigerant and unscrew the pressure switch from the refrigerant system.

(6) Remove electrical connector P4 from the junction box and unsolder two unmarked wires from connector.

b. Installation Installation of the pressure switch shall be in the reverse order of removal. Evacuate and re-charge the refrigerant system (para 5-8 *d* and para 5-8 *e*).

5-15. Pressure Switches S5 and S6

a. General. Pressure switches S5 and S6 are contained in an enclosure behind the rear panel and toward the top. The pressure switches and enclosure must be removed as an assembly, then the switches removed from the enclosure.

b. Removal.

(1) Remove fifteen screws securing the top panel on the air conditioner and remove the panel.

(2) Discharge the refrigerant system (para 5-8 *b*).

(3) Remove the capillary tubing of each pressure switch by removing the flare nut from the refrigerant tubing.

(4) Remove four screws from the outside of the rear panel that holds the pressure switch enclosure assembly. Remove the assembly, being careful not to damage the capillary tubing on each pressure switch.

(5) Remove two screws holding each pressure switch to the enclosure and remove the switches.

c. Installation. Installation of the pressure switches shall be the reverse of removal. Care must be taken so as not to damage the capillary tubing of each switch and that each one is connected properly. Evacuate and re-charge the refrigerant system (para 5-8 *d* and 5-8e).

5-16. Service Valves

a. Removal.

(1) Discharge the refrigerant system (para 5-8 *b*).

(2) Remove fifteen screws and remove the top panel.

(3) Remove service valve access panel.

(4) Remove screw and clamp holding the charging valve.

(5) Using heat remove the tubing from the charging valve to be removed.

(6) Remove the service valve from the air conditioner.

NOTE

Valve cores may be replaced if defective.

b. Installation. Installation of the service valves shall be in reverse order of removal. Be sure that all soldered connections are tight. Evacuate and recharge the refrigerant system (para 5-8 *d* and para 5-8 *e*).

5-17. Solenoid Valves

a. Removal.

(1) Unsolder the electrical cable to the solenoid valve to be removed. The leads to the solenoid valves are soldered to connector P4 which connects to the rear of the junction box.

CAUTION

The solenoid valve must be disassembled before disconnecting the tubing from the valves to avoid heat distortion.

(2) Remove two screws securing the lower portion of the valve to the upper assembly and remove the upper assembly. Remove the diaphragm from the lower assembly.

(3) Discharge the refrigerant system (para 5-8 *b*).

(4) Using heat, disconnect the tubing from the lower portion of the valve.

(5) Remove two screws securing the lower

portion of the valve to the mounting bracket and remove the lower portion.

b. Installation. Installation of the solenoid valves shall be in reverse order of removal. Be sure that all soldered connections are tight and that all wiring connections are tight and that the valve is reassembled correctly after connections are soldered. Evacuate and re-charge the refrigerant system (para 5-8 *d* and para 5-8 *e*).

5-18. Expansion Valves

a. Removal.

(1) Discharge the refrigerant system (para 5-8 *b*).

(2) Remove 15 screws, securing the top panel, and remove panel from the air conditioner.

(3) Remove screws and clamps securing the sensing element for the expansion valve.

(4) Remove 2 screws securing the valve to the unit, and remove the top portion of the valve.

(5) Melt solder and disconnect refrigerant tubes.

b. Installation. Installation of the thermostatic expansion valves shall be in reverse order of removal. Be sure that all soldered connections are tight. Evacuate and re-charge the refrigerant system (para 5-8 *d* and para 5-8 *e*). Check for the proper superheat adjustment of the valve and adjust if required (para 4-62).

5-19. Fluid Pressure Regulator.

a. Removal.

(1) Discharge the refrigerant system (para 5-8 *b*).

(2) Remove fifteen screws securing the top panel on the air conditioner and remove the top panel.

(3) Unsolder the refrigerant lines from the fluid pressure regulator.

(4) Remove mounting clamp and screw.

(5) Remove the regulator from the system.

b. Installation. Installation of the fluid pressure regulator shall be the reverse of removal. Evacuate and re-charge the refrigerant system (para 5-8 *d* and para 5-8 *e*).

5-20. Pressure Relief Valve

a. Removal.

(1) Remove two screws securing the lower front panel and remove the front panel.

(2) Remove junction box assembly (para 4-36).

(3) Discharge the refrigerant (para 5-8 *b*) and unscrew the relief valve from the system fitting.

b. Installation. Installation shall be the reverse order of removal. Be sure relief valve fitting is tight. Evacuate and re-charge the refrigerant system (para 5-8 *d* and para 5-8 *e*).

5-21. Sight Glass

a. Removal.

(1) Remove fifteen screws securing the air conditioner top panel and remove the top panel.

(2) Discharge the refrigerant system (para 5-8 *b*).

(3) Unsolder the sight glass refrigerant line connections.

(4) Remove two screws securing the sight glass to the air conditioner rear panel and remove the sight glass, spacer and gasket.

b. Installation. Installation of the sight glass shall be the opposite of removal. Evacuate and re-charge the refrigerant system (para 5-8 *d* and para 5-8 *e*).

5-22. Compressor

a. Removal.

(1) Loosen two screws from the front panel and remove the panel.

(2) Remove junction box assembly (para 4-36).

(3) Discharge refrigerant from system (para 5-8 *b*) and disconnect the electrical connector P3 from J3 on the compressor motor.

(4) Remove insulation from suction tube. Melt solder and disconnect suction and discharge tubes from the compressor.

(5) To remove compressor from base, first remove 4 nuts, washers, bolts and mounting bushings from the compressor mount, then lift the compressor from the base.

(6) Check the rubber resilient mounts through which the four compressor mounting bolts pass in the base panel of the air conditioner. Replace if required.

b. Installation. Installation of the compressor shall be in the reverse order of removal. Evacuate and re-charge the refrigerant system (para 5-8 *d* and para 5-8 *e*).

5-23. Service of the Compressor

a. General. The compressor itself is non-repairable and must be replaced. A pre-cooler coil, a filter and the mounting hardware for the compressor may be replaced if damage to the items has occurred. To determine if the compressor is operating normally, refer to table 4-3 for normal operating pressures and currents. The windings of the compressor motor should be checked with an ohmmeter with the reading to be .6 to .8 ohms across the main winding and 5 to 7 ohms across the auxiliary winding (A to C, B to A).

b. Disassembly.

(1) Discharge the refrigerant system (para 5-8 *b*).

(2) Unsolder the pre-cooler coil at both ends and remove the coil from the compressor.

(3) Unsolder the suction strainer from the compressor and tubing and remove the strainer.

c. Cleaning, Inspection, and Replacement.

(1) Plug the compressor tubing ends. Clean scale and corrosion from the pre-cooler, compressor and suction strainer with a stiff bristle brush and soft wire brush.

(2) Any paint removed from the compressor should be retouched or the whole compressor repainted.

(3) Use a cloth dampened in a dry cleaning solvent, Federal Specification P-S-661, and wipe the compressor, coil and filter.

(4) Use dry compressed air and blow out the inside of the pre-cooler.

(5) Inspect the pre-cooler for dents, cracks or other damage. Replace if damaged.

(6) Evacuate and re-charge the refrigerant system (para 5-8 *d* and para 5-8 *e*).

5-24. Compressor-Motor Burnout Clean-up Procedure

a. General. Experience has demonstrated that after a hermetic motor burnout the system must be cleaned thoroughly to remove all contaminants; otherwise a repeat burnout will occur. Failure to follow these instructions as quickly as possible will result in an excessive risk of a repeat burnout and damage to other system components.

b. Clean-Up Procedure. Make certain that a burnout has occurred. A motor that fails to start may be due to improper voltage or malfunction of the compressor start relay, or a compressor mechanical fault.

(1) To check for proper voltage, turn off the main disconnect switch so that all power is off.

(2) Remove the front access cover.

(3) Remove the compressor leads at the compressor side of the compressor start relay.

(4) Close the disconnect switch to energize the control circuit.

(5) Check for voltage on all lines at both the line and load side of the compressor start relay.

NOTE

Before checking the compressor motor, make sure the compressor is cool to the touch. Otherwise a false indication may be obtained due to internal motor protectors being open.

(6) Check the compressor motor to see if it is electrically grounded or open. A 500-volt megger or an ohmmeter can be used for making the test. Typical megger readings are 60 megohms for R-22. If no fault is found, check the winding resistance values with an ohmmeter.

(7) Purge a small quantity of refrigerant gas from the compressor and smell it cautiously. A motor burnout is usually indicated by the customary burned odor.

c. Safety Measures. In addition to the electrical hazards, the serviceman should be aware of the possibility of acid burns.

(1) When testing for odor, release a small amount of gas and smell it cautiously to avoid inhalation of toxic decomposition products.

(2) When discharging gas or liquid refrigerant from a burnout, avoid eye or skin contact with the product. If the entire charge is to be removed, it should be discharged outside any enclosure. Do not discharge in the vicinity of open flame.

(3) When necessary to come in contact with oil or sludge from a burned out compressor, approved rubber gloves should be worn to avoid acid burns.

d. Determine Severity of Burnout. It is helpful to classify burnouts as "mild" or "severe" and to use the severity as a guide for the clean-up procedure to be followed. The severity can be determined by the following means:

(1) If possible, obtain a small sample of oil from the burned out compressor and analyze it, using an acid test kit. Excessive acidity (over 0.05 acid number) in the oil indicates a severe burnout. This is the best method of determining the severity of burnout. Discoloration of the oil may also indicate a severe burnout.

(2) If none of the above indications of severe contamination are found, then the burnout can be classified as mild.

e. Clean-up After a Mild Burnout. When the burnout is mild, the contaminant can be removed by changing the liquid line dehydrator. The procedure to follow is:

(1) Discharge the refrigerant system (para 5-8 *b*).

(2) Remove the burned out compressor and install the replacement (para 5-22).

(3) Remove the dehydrator (para 5-13) and install an oversize replacement dehydrator.

(4) Evacuate the system (para 5-8 *d*).

(5) Recharge the system and put in operation (para 5-8 *e*).

f. Clean-up After a Severe Burnout. Complete cleaning of the system is required.

(1) Discharge the refrigerant system (para 5-8 *b*).

(2) Install a dehydrator in the suction line, change suction strainer, as well as changing or installing an oversize liquid line dehydrator. In this way the suction dehydrator protects the new compressor from any contaminants that may remain in the system. Leaving a permanent type dehydrator in the suction line allows the serviceman to complete the clean-up at one time. A pressure tap should be installed upstream of the suction

dehydrator so that the pressure drop from the tap to the service valve can be checked after several hours of operation. A pressure drop in excess of 3 PSI is generally considered excessive.

(3) Check the expansion valves and clean or replace them (para 5-18). Replace sight glass (para 5-21).

(4) Remove the burned out compressor and install the replacement (para 5-22).

(5) Evacuate the system (para 5-8 *d*).

(6) Recharge the system and put in operation (para 5-8 *e*).

(7) Check pressure drop across suction dehydrator after one hour operation. Change if the pressure drop is excessive.

(8) After 8 to 24 hours operation, change suction dehydrator, check odor and color of oil or test with test kit. Evacuate and recharge system (para 5-8 *d* and para 5-8 *e*).

(9) After 14 days of operation, check color and acidity of oil. If required, change dehydrators. Before clean-up is completed, it is essential that oil is clean and no acid is present.

NOTE

The new compressor should not be used for pulling a vacuum. Pull a high vacuum (less than 500 microns) for several hours. Allow the system to stand several hours to be sure the vacuum is maintained.

5-25. Evaporator Coil

a. Removal.

(1) Remove 15 screws, securing the top panel, and remove the panel.

(2) Remove 4 screws, securing the discharge grille, and remove the grille.

(3) Discharge the refrigerant system (para 5-8 *b*).

(4) Unsolder refrigerant line connection to the expansion valve body after removing the valve power element and cage assembly.

(5) Unsolder refrigerant line connection leaving the evaporator coil.

(6) Remove six screws, securing the coil to the case assembly, and carefully lift the evaporator coil from the air conditioner.

b. Installation. Installation of the evaporator coil shall be in reverse order of removal. Refrigerant system must now be evacuated and recharged (para 5-8 *d* and para 5-8 *e*).

5-26. Condenser Coil and Subcooler

a. General. The condenser coil and subcooler are an integral unit which are removed from the air conditioner as a single item.

b. Removal.

(1) Remove eight screws and remove the condenser guard and screen.

(2) Remove two screws and remove the front panel.

(3) Remove junction box assembly (para 4-36).

(4) Discharge the refrigerant system (para 5-8 *b*) and unsolder the refrigerant lines.

(5) Unsolder the refrigerant lines from the receiver.

(6) Remove eight screws, securing the condenser coil assembly to the air conditioner case and remove the assembly.

c. Installation. Installation of the condenser coil, subcooler and receiver shall be in reverse order of removal. Refrigerant system must now be evacuated and recharged (para 5-8 *d* and para 5-8 *e*).

5-27. Circuit Breaker Actuator and Cable

a. Removal.

(1) Remove the junction box (para 4-36).

(2) Unscrew the circuit breaker reset knob from the cable connection at the rear of the air conditioner. Remove the lockwasher, nut and lock nut which secure the cable to the back panel of the casing.

(3) Remove the cable assembly from the air conditioner taking care not to lose the lockwasher remaining on the threaded end.

b. Installation. Installation shall be in reverse order of removal. When clamping the cable end to the junction box insure that the circuit breaker is free to move to its closed (up) position. Adjust the end fitting core on the actuator cable so that the circuit breaker is free to move to the fully open (down) position.

CHAPTER 6

REPAIR INSTRUCTIONS

Section I. CONTROL MODULE REPAIR

6-1. Control Panel

a. General. The control panel contains the electrical switches that enable the operator to select the appropriate method of heating, cooling or ventilation required at a given time. This panel may be disassembled, inspected and defective parts replaced as required.

b. Disassembly.

(1) Remove the front access panel and the intake grille by removing the screws attaching them to the casing. Remove the air filter. Disconnect the temperature sensing bulb by removing screw and clamp and push it down through the grommet until it is out of the way.

(2) Disconnect the electrical power connect to the control panel.

(3) Remove the four screws that secure the control panel to the top of the junction box.

(4) Remove the knobs from the front of the panel by loosening the setscrews. Remove nut and washer which secure the temperature control thermostat to the front of the control panel.

(5) Remove the rear panel by removing four screws and nuts.

(6) Remove four screws and washers securing the electrical connector and wiring harness to the left end of the control panel. First disconnect wiring harness leads after tagging them. Remove and tag the three separate electrical leads.

(7) Disconnect ground wire lead by removing screw, washers and nut.

(8) Remove the temperature control by removing four screws and nuts from the rear panel.

(9) Remove the fan speed switch and selector switch by removing the nuts and washers which secure them to the front of the control panel.

c. Inspection. Inspect all components of control panel assembly for cracks, breaks, and dirt or other foreign substances.

d. Cleaning. Clean all parts in dry cleaning solvent, Federal Specification P-S-661. Use a stiff bristle brush to brush away dirt, scale, and other foreign matter. Use low pressure, dry, compressed air to blow cleaned components dry.

e. Repair or Replacement. Replace all defective parts.

f. Reassembly. Reassembly shall be in the reverse order of disassembly. Make sure all tagged wires are connected to the proper terminals.

6-2. Junction Box

a. General. The junction box is the electrical nerve center of the air conditioner. Contained herein are the relays, fuses, trnasformer, terminal boards, circuit breaker and rectifier. This box may be disassembled, components inspected, tested, and defective parts replaced as required.

b. Disassembly.

(1) Remove the front access panel.

(2) Remove the control panel from the junction box top as described in paragraph 6-1.

(3) Disconnect the two electrical connectors from the rear of the junction box.

(4) Remove the circuit breaker re-set cable end fitting. Remove the two clamps which hold the cable to the right end of the junction box by removing two screws and spacers.

(5) Remove the ground lead from the back of the junction box by removing the screw, washers and nut. Remove the other end of the lead from the casing ground by removing the screw and washer which secure the casing to the base panel in the lower left front corner of the air conditioner.

(6) Loosen two screws on each side of box and remove junction box assembly.

(7) Remove the front cover of the junction box by loosening the four screws.

(8) Disconnect and tag the leads to circuit breaker. Remove the six screws holding the circuit breaker and cover plate and remove the circuit breaker and circuit breaker cover from the right end of the junction box.

(9) Remove the circuit breaker reset lever by removing the pin in the circuit breaker throw bar.

(10) Remove the two fuses from the fuse holders on the left end of the junction box.

(11) Disconnect and tag the leads from the transformer. Remove the capacitor from the two output therminals XI and X2 of the transformer. Remove the transformer by removing the four nuts securing it to the junction box top panel.

(12) Disconnect and tag all electrical leads.

(13) Remove time delay relays by removing three screws. Remove the two time delay relays by removing four screws and nuts.

(14) Remove rectifier by removing nut and washer from the left of the top panel of the junction box.

(15) Remove wiring harnesses by removing screws, nuts and gaskets.

(16) Remove relays by removing screws and nuts.

(17) Remove fuseholders and backing insulation by removing screws and nuts from the left end of the junction box.

(18) Remove terminal boards by removing screws and nuts.

c. Cleaning. Clean all parts by using a stiff bristle brush to remove dirt, scale, and other foreign matter.

d. Inspection. Inspect all components for cracks, breaks or loose connections.

e. Repair or Replacement. Replace all defective parts. Tighten all loose connections.

f. Reassembly. Reassembly shall be in the reverse order of disassembly. Make sure all tagged wires are connected to their proper terminals.

Section II. FAN MOTOR REPAIR

6-3. General

The two speed fan motor may be disassembled and any worn or defective parts replaced in the procedures that follow. The fan motor drives the condenser and evaporator fans.

6-4. Disassembly

a. Remove the fan motor from the air conditioner (para 4-34).

b. Remove the retainer screws securing the end bell on the motor and remove the end bell.

c. Carefully remove the rotor and shaft assembly from the stator assembly.

d. Remove the bearings from the end bell and from the stator assembly.

e. Remove four screws securing the electrical connector to the stator assembly. Pull the connector out as far as the wires will permit it to extend then unsolder the wires. Be sure each wire is marked for later identification.

f. Remove four screws securing the terminal box to the stator housing and remove the box.

6-5. Cleaning

a. Clean all parts in dry cleaning solvent, Federal Specifications P-S-661. Use a stiff bristle brush to brush away dirt, scale and other foreign matter.

b. Use compressed air to blow out loose material in hard to get to areas. Do not spin the bearings with compressed air.

c. Using a soft cloth carefully wipe all machined surfaces with a light oil. Lubricate the bearings with grease conforming to MIL-G-25013 if required. Do not overgrease.

6-6. Inspection

a. Check the bearings for discoloration, fractures, wear, pits, etc.

b. Check the rotor for signs of dragging, check its shaft for signs of wear or corrosion.

c. Using a suitable ohmmeter, measure the resistance of the stator windings as follows:

(1) E to C = 37 - 39 ohms
(2) D to C = 27 - 29 ohms
(3) B to C = 14 - 15 ohms
(4) A to C = 4 - 6 ohms

d. Inspect the stator housing for signs of cracking. Check the pole pieces for signs of rotor dragging.

e. Check the electrical connector for bent pins, corrosion and fractures.

f. After the motor is reassembled, check the motor shaft for freedom to turn. Shaft should turn freely without any signs of dragging or binding.

6-7. Repair or Replacement

a. Replace bearings that show discoloration, fractures, wear, pits, etc.

b. If rotor shows defects or fractures or its shaft shows wear, replace.

c. Replace stators with shorted or open windings. Replace stator assembly if thermal protector is defective.

d. Replace damaged electrical connector.

6-8. Reassembly

Reassembly shall be in reverse order of disassembly. Make sure all wires are resoldered to their proper connections.

Section III. EVAPORATOR AND CONDENSER COIL REPAIR

6-9. General

The evaporator coil extracts heat from the air conditioned space by the vaporization of liquid refrigerant passing through its tubed path. The condenser coil rejects the heat picked up by the evaporator coil and the heat of compression to the outdoor air. The lower portion of the condenser coil serves to cool the liquid refrigerant below its saturated condensing temperature. The evaporator and condenser coils are essentially non-repairable

items other than servicing specified in paragraphs 4-66 and 4-67.

6-10. Removal

Remove the evaporator and condenser coils as specified and in paragraphs 5-25 and 5-26 respectively.

WARNING

Refrigerant system must be discharged before opening the refrigerant system (Para 5-8b).

6-11. Repair or Replacement

Coils with internal leaks in tubes in the finned surface are not repairable and must be replaced. Leaks in the return bends and header tubes may in most cases be repaired by brazing open joints or replacement of return bends.

6-12. Installation

Install the evaporator or condenser coil in the reverse order of removal. Upon completion of installation evacuate and recharge the system (para 5-8 *d* and para 5-8 *e*).

Section IV. CASING ASSEMBLY REPAIR

6-13. General

The casing assembly is an integral unit except for gasketing and insulation. These items may be replaced if damaged or loose.

6-14. Disassembly

a. Remove any panels or grilles attached with screws. Do not attempt to disassemble or separate panels or frames that are secured with rivets.

b. If a case assembly is to be discharged be sure that all components are removed. Procedures for removing all items are contained in Chapters 4 and 5 of this manual.

6-15. Cleaning

a. Remove scales, loose paint and corrosion with a wire brush.

b. Blow loose dirt from seams and corners with compressed air.

c. Use a light air blast to blow dust and dirt from the insulation.

d. Using a cloth dampened in a dry cleaning solvent, Federal Specification P-S-661, wipe both the inside and outside of the casing, grilles and panels.

6-16. Inspection

Inspect the casing for loose rivets, weldments, dents, cracks and damaged finish.

6-17. Repair and Replacement

a. Small dents in the casing or panels may be straightened. Loose rivets should be drilled out and replaced and broken welds should be rewelded.

b. If the casing is excessively damaged, it must be replaced.

c. Any finish missing from the casing must be retouched or the whole casing assembly refinished.

d. Replace wet, dirty or damaged insulation.

6-18. Reassembly

Reassemble the casing in reverse order o disassembly.

CHAPTER 7

MAINTENANCE OF MATERIAL USED IN CONJUNCTION WITH MAJOR ITEM

Section I. SOUND ATTENUATOR

7-1. Inspection

The sound attenuator should be inspected for damaged or loose acoustical insulation, loose rivets or bent metal parts.

7-2. Repair

Loose or damaged insulation should be re-glued or replaced. Loose rivets should be drilled out and replaced. Slightly bent metal parts should be straightened. The metal parts should be repainted where required taking care not to apply paint to the insulation.

Section II. CANVAS COVER

7-3. Inspection

The canvas cover should be inspected for rips in the fabric or thread.

7-4. Repair

Small rips should be repaired to prevent spreading. The cover should be cleaned as required.

APPENDIX A

REFERENCES

A-1. Fire Protection	
TB 5-4200-200-10	Hand Portable Fire Extinguishers for Army Users
A-2. Lubrication	
C91001L	Fuels. Lubricants, Oils and Waxes
A-3. Radio Suppression	
TM 11-483	Radio Interference Suppression
A-4. Maintenance	
TM 5-4120-336-24P	Repair Parts and Special Tool List
TM 38-750	Army Maintenance Management System
TM 5-764	Electric Motor and Generator Repair
A-5. Shipment and Storage	
TB 740-93-2	Preservation of USAMEC Mechanical Equipment for Shipment and Storage
TM 740-90-1	Administrative Storage of Equipment
A-6. Destruction	
TM 750-244-3	Procedures for Destruction of Equipment to Prevent Enemy Use

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the identified end item or component will be consistent with the assigned maintenance functions.

c. Section III. (Not applicable).

d. Section IV. (Not applicable).

B-2. Explanation of Columns in Section II

a. Group Number, Column (1). The assembly group number is a numerical group assigned to each assembly. The assembly groups are listed on the MAC in disassembly sequence beginning with the first assembly removed in a top down disassembly sequence.

b. Assembly Group, Column (2). This column contains a brief description of the components of each assembly group.

c. Maintenance Functions, Column (3). This column lists the various maintenance functions (A through K). The upper case letter placed in the appropriate column indicates the lowest maintenance level authorized to perform these functions. The active repair time required to perform the maintenance function is included directly below the symbol identifying the category of maintenance. The symbol designations for the various maintenance levels are as follows:

C—Operator or crew
O—Organizational maintenance
F—Direct support maintenance
H—General support maintenance
D—Depot maintenance

The maintenance functions are defined as follows:

A—Inspect: To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.

B—Test: To verify serviceability and to detect electrical or mechanical failure by use of text equipment.

C—Service: To clean, to preserve, to charge, and to add fuel, lubricants, cooling agents, and air. (If it is desired that elements, such as painting and lubricating, be defined separately, they may be so listed).

D—Adjust: To rectify to the extent necessary to bring into proper operating range.

E—Aline: To adjust specified variable elements of an item to bring to optimum performance.

F—Calibrate: To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

G—Install: To set up for use in an operational environment such as an emplacment, site, or vehicle.

H—Replace: To replace unserviceable items with serviceable like items.

I—Repair: Those maintenance operations necessary to restore an item to serviceable condition through correction of material damage or a specific failure. Repair may be accomplished at each level of maintenance.

J—Overhaul: Normally, the highest degree of maintenance performed by the Army in order to minimize time work is in process consistent with quality and economy of operation. It consists of that maintenance necessary to restore an item to completely serviceable condition as prescribed by maintenance standards in technical publications for each item of equipment. Overhaul normally does not return on item to like new, zero mileage, or zero hour condition.

K—Rebuild: The highest degree of materiel maintenance. It consists of restoring equipment as nearly as possible to new condition in accordance with original manufacturing standards. Rebuild is performed only when required by operational considerations or other paramount factors and then only at the depot maintenance level. Rebuild reduces to zero the hours or miles the equipment, or component thereof, has been in use.

d. Tools and Equipment, Column (4). This column is provided for referencing by code the special tools and test equipment (sec. III), required to perform the maintenance functions (sec. II).

e. Remarks, Column (5). This colur provided for referencing by code the remark IV) pertinent to the maintenance functions

Section II. MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment
		A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild	
01	FRAME												
	Frame Assy	C	..		..	..	..	..	..	F			
		0.1	..	..	..	..	..	..	..	0.1			
02	PANELS AND GRILLS												
	Panels	C	..	..	..	..	..	..	O	O			
		0.1	..	.	..	..	..	..	0.2	0.5			
	Grille	C	.	..	C	..	..	..	O	O			
		0.1	.	..	0.1	..	..	.	0.2	0.5			
03	ACCESSORY ITEMS												
	Canvas Condenser Cover	O	..		..	..	..	..	O	O			
		0.1	.		..	..	..	..	0.2	0.5			
	Blockoff	.	..	.	..	..	..	O	O				
		..	..	..	..	..	..	1.0	1.0				
	Sound Attenuator	O	..	..	..	..	..	..	O				
		0.1	..	..	.	..	..	..	0.5				
04	ELECTRIC MOTOR & BLOWER												
	Motor Assy Evaporator	O	O	..	.	..	..	..	O	F			
		0.1	0.4	..	..	..	..	..	8.0	8.0			
	Motor Assy Condenser	O	O	..	..	.	..	..	..	O	F		
		0.1	0.4	..	..	.	..	..	..	8.0	8.0		
	Condenser Fan	O	..	..	..	..	..	..	O				
		0.1	..	..	..	..	.	.	0.5				
	Evaporator Blower	O	..	.	..	..	..	..	O				
		0.1	..	.	..	..	..	..	0.5				
05	STARTING & PROTECTIVE DEVICES												
	Protectors, Overload Temperature / Current	O	O										
		0.1	0.2										
	Capacitors	O	O	..	..	..	..	..	O				
		0.1	0.2	..	..	..	..	..	0.3				
	Relays	O	O	.	..	..	..	..	O				
		0.1	0.2	.	.	..	.	..	0.4				
	Fuses	O	O	..	..	..	..	..	O				
		0.1	0.1	..	..	..	..	..	0.1				
06	MASTER OR AUXILIARY CONTROL ASSY												
	Contactors, Electrical	O	O	O	..	.	..	..	O				
		0.1	0.2	0.2	..	..	..	..	0.4				
	Control Module	O	O	..	.	..	..	..	O	F			
		0.1	0.1	..	.	..	..	..	0.4	1.0			
	Transformer	O	O	..	..	..	..	..	O				
		0.1	0.2	..	..	..	..	..	0.5				
07	CIRCUIT BREAKER												
	Compressor Circuit Breaker	..	O	..	..	..	..	..	O				
		..	0.1	..	..	..	..	..	0.5				
08	SWITCHES												
	Selector Switch	..	O	..	..	.	..	..	O				
		..	0.1	..	..	..	..	..	0.5				
	Evaporator Fan Speed Switch	..	O	..	..	..	..	..	O				
		..	0.1	..	..	..	..	..	0.5				
	Thermostatic Switch	..	O	..	..	..	..	..	O				
		..	0.1	..	..	..	..	..	0.5				

(1) Group No.	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild		
	Pressure Switch	..	O	..	..	..	.	..	F					
		..	0.1	.	.	..	..	.	4.0					
09	HEATING UNITS													
	Heater, Electrical	O	O	..	.	.	.	..	O					
		0.1	0.2		..	..	..	.	1.0					
10	NON-ROTATING RECTIFIERS													
	Rectifiers	O	O	..	..	..	..	..	O					
		0.1	0.2		..	..	..	..	0.5					
11	ELECTRICAL WIRING													
	Wiring Harness Assy	O	O	..	..	..	..	..	O	O				
		0.2	0.2		..	..	..	..	1.0	0.5				
12	GAGES (NON-ELECTRICAL) AND MEASURING DEVICES													
	Sight Glass	O	.	.	..	..	.	..	F					
		0.1	..		.	.	..	.	4.0					
13	COMPRESSOR ASSEMBLY													
	Compressor Assy	O	O	F	..	..	..	..	H					
		0.1	0.2	4.0	..	..	..	..	16.0					
	Mount, Resilient	O	..	..	.	.	.	..	H					
		0.1	..	..	..	..	.	..	1.0					
14	REFRIGERANT PIPING													
	Piping	O	O	.	..	..	..	..	F	F				
		0.1	0.2	.	..	.	..	..	4.0	4.0				
	Valve, Solenoid Liquid	O	O	..	.	..	..	..	F					
		0.1	0.1	.	..	..	..	..	4.0					
	Valve, Solenoid Equalization	O	O	.	..	..	..	..	F					
		0.1	0.1	..	.	..	..	..	4.0					
	Valve, Charging		O		..	..	..	.	F					
		..	0.1	..	..	..	.	.	4.0					
	Actuator, w / Cable	O	O	.	O	..	..	..	F					
		0.1	0.1	..	0.3	..	..	..	4.0					
	Strainer, Suction	O	..	..	.	..	..	..	F					
		0.1	.	.	.	..	..	..	4.0					
	Valve, Expansion	..	O	..	F	..	..	..	F					
		..	0.1	..	1.0	..	..	..	4.0					
	Valve, Pressure Relief	O	..	.	..	..	..	..	F					
		0.1	..	..	..	..	..	..	4.0					
	Valve, Pressure Regulator	O		..	..	..	..	..	F					
		0.1	..	..	..	.	..	..	4.0					
15	CONDENSER													
	Condenser	O	O	O	..	..	..	..	F	F				
		0.1	0.2	1.0	..	..	..	..	4.0	5.0				
16	EVAPORATOR													
	Evaporator Coil	O	O	O	..	..	..	..	F	F				
		0.1	0.2	1.0	..	..	..	..	4.0	5.0				
	Tubes, Drain	O	..	..	..	..	..	..	O	O				
		0.1	..	..	..	..	..	..	0.5	0.5				
17	HYDRATING EQUIPMENT													
	Dehydrator	O	..	.	..	.	..	..	F					
		0.1	..	..	..	..	.	..	4.0					
18	AIR FILTER													
	Filter	O	.	O	.	..	.	..	O					
		0.1	..	0.5	..	.	..	..	0.1					

ALPHABETICAL INDEX

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:
VERNE L. BOWERS
Major General, United States Army
The Adjutant General

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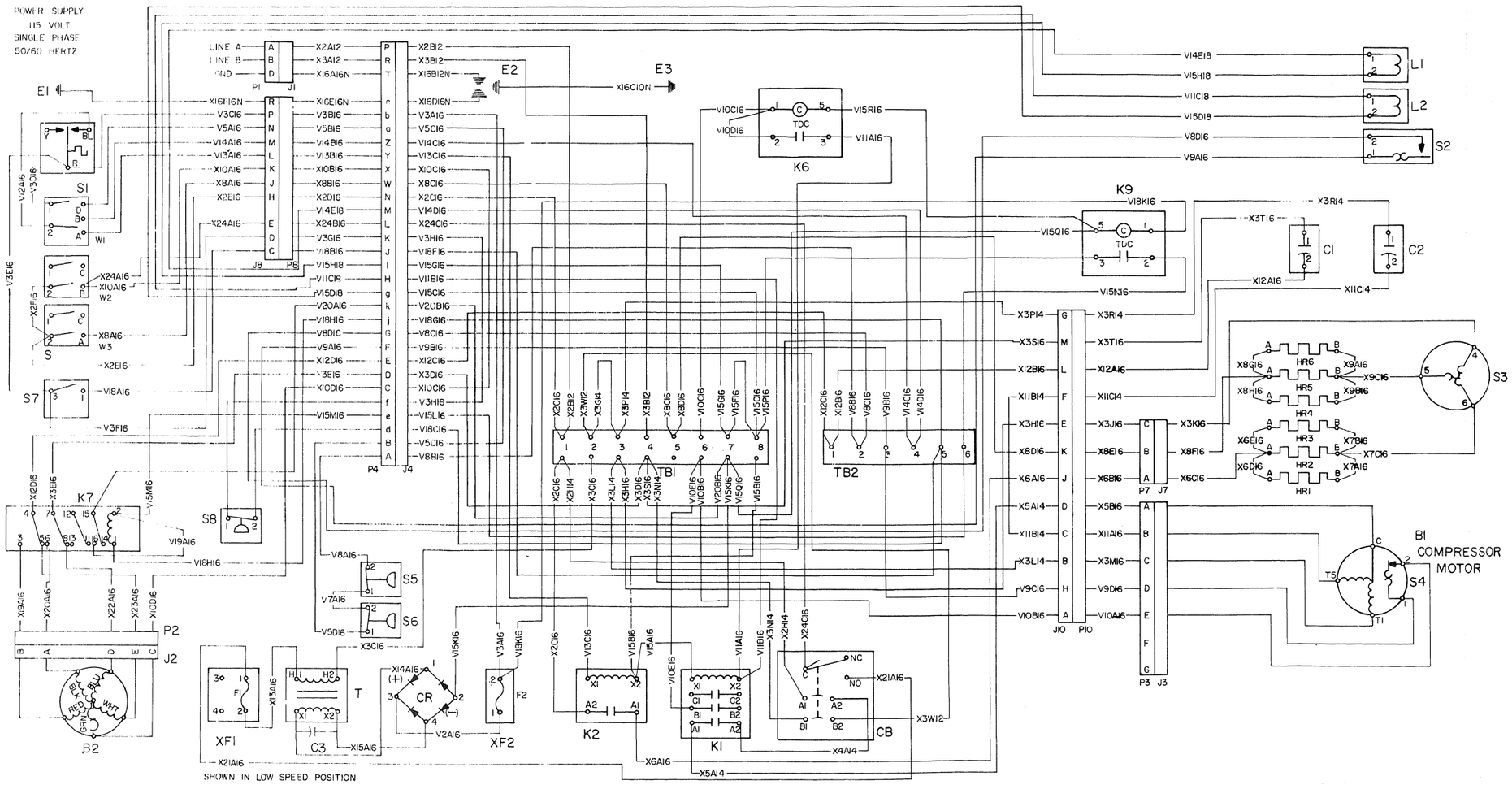


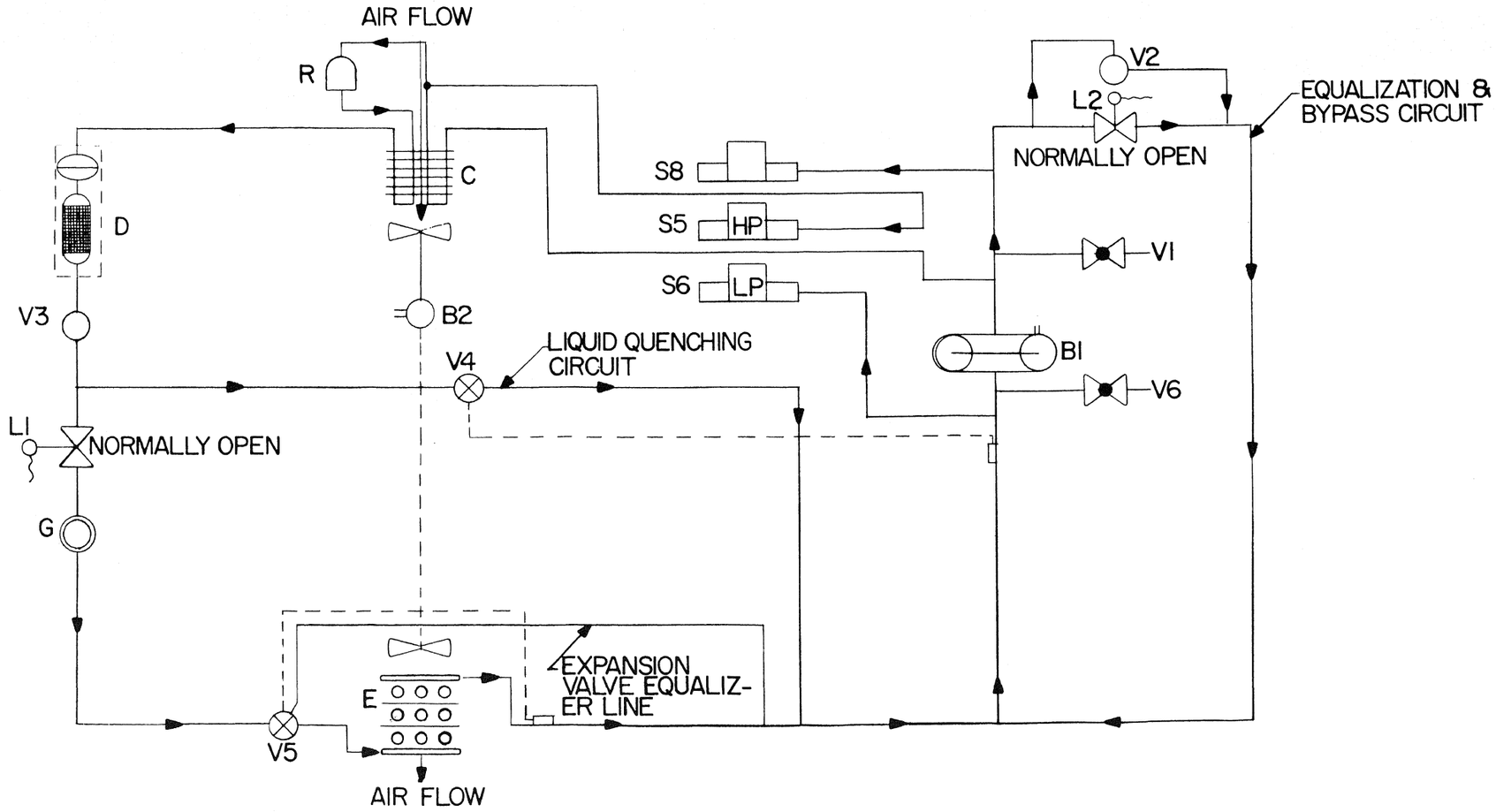
SWITCH POSITION						
	CONTACT NO.	1 HI-HEAT	2 LO-HEAT	3 OFF	4 VENT	5 COOL
S/W1	2 & A	CLOSED	CLOSED	OPEN	OPEN	OPEN
	2 & B	OPEN	OPEN	OPEN	OPEN	CLOSED
	1 & D	OPEN	OPEN	OPEN	OPEN	CLOSED
S/W2	2 & B	CLOSED	CLOSED	OPEN	CLOSED	CLOSED
S/W3	2 & A	CLOSED	OPEN	OPEN	OPEN	OPEN

LEGEND		
SYMBOL	PART NO.	DESCRIPTION
K9	13216E5182-2	RELAY, TIME DELAY, FAN MOTOR
J1	MS3100R-20-4PX	CONNECTOR RECEPTACLE
P1	MS3106R-20-4SX	CONNECTOR PLUG
J2	MS3102R-14S-6P	CONNECTOR RECEPTACLE
P2	MS3106R-14S-6S	CONNECTOR PLUG
J3	MS3102R-16S-1P	CONNECTOR RECEPTACLE
P3	MS3106R-16S-1S	CONNECTOR PLUG
J4	MS3102R-32-7P	CONNECTOR RECEPTACLE
P4	MS3106R-32-7S	CONNECTOR PLUG
E1	MS35207-267	GROUND, CONTROL PANEL
E2	MS35207-267	GROUND, JUNCTION BOX
E3	MS90726-5	GROUND, FRAME
L1	13214E3324	VALVE, SOLENOID, LIQUID LINE
J7	MS3100R-16-10P	CONNECTOR RECEPTACLE
P7	MS3106R-16-10S	CONNECTOR PLUG
J8	13211E8390C-28-17P	CONNECTOR RECEPTACLE
P8	MS3100R-28-17S	CONNECTOR RECEPTACLE
C2	13214E3529-1	CAPACITOR, COMPRESSOR MOTOR
J10	MS3102R-28-9S	CONNECTOR RECEPTACLE
P10	MS3106R-28-9P	CONNECTOR, PLUG
B1	13214E3538-1	MOTOR, COMPRESSOR
B2	13214E3728-1	MOTOR, ALTERNATING CURRENT, FAN
C1	13214E3529-1	CAPACITOR, FAN MOTOR
K7	13216E7688	RELAY, FAN
CB	13216E6205-4	CIRCUIT BREAKER
CR	13214E3652	RECTIFIER, SEMICONDUCTOR DEVICE
F1	MIL-F-15160	FUSE TYPE FNQ250, 2A
F2	13211E3785	FUSE
HR1-6	13214E3561	HEATING ELEMENT
K1	MS24102-D1	RELAY, COMPRESSOR
K2	MS24192-D1	RELAY, HEATER
L2	13214E3324	VALVE, SOLENOID, PRESSURE EQUALIZER
S8	13216E7690-2	SWITCH, PRESSURE CONTROL
K6	13216E6182-3	RELAY, TIME DELAY, COMPRESSOR
S	13211E8298	SWITCH, ROTARY
S1	13211E8301-1	THERMOSTAT, TEMPERATURE CONTROL
S2	13211E8180	THERMOSTAT, AMBIENT AIR TEMPERATURE
S3	13211E8265	THERMOSTAT HEATER
S4	P/O 13214E3538-1	THERMOSTAT, COMPRESSOR
S5	13211E8404	SWITCH, HIGH PRESSURE CUTOUT
S6	13214E3794	SWITCH, LOW PRESSURE CUTOUT
S7	MS24523-22	SWITCH, TOGGLE, FAN, HI-LO SPEED
T	13214E3618-2	TRANSFORMER
TB1	MIL-T-55164/3B	TERMINAL BOARD
TB2	13214E3704	TERMINAL BOARD
XF1	13211E3784	FUSEHOLDER, POWER INPUT, AC
XF2	13214E3811	FUSEHOLDER, CONTROL VOLTAGE, DC
C3	13219E9891	CAPACITOR ASSEMBLY

ME4120-335-14/1-5

Figure 1-5. Wiring diagram.

Figure 1-5



COMPONENT REFERENCE LIST	
DESIGNATION	DESCRIPTION
B1	COMPRESSOR
B2	FAN MOTOR
C	COIL, CONDENSER
D	FILTER-DRIER, REFRIGERANT
E	COIL, EVAPORATOR
G	GLASS,SIGHT
L1	VALVE, SOLENOID
L2	VALVE, SOLENOID
R	RECEIVER
S5	SWITCH, HIGH PRESSURE CUTOUT
S6	SWITCH, LOW PRESSURE CUTOUT
S8	SWITCH, PRESSURE
V1	VALVE, CHARGING WITH CAP
V2	REGULATOR, FLUID PRESSURE
V3	VALVE, PRESSURE RELIEF
V4	VALVE, EXPANSION
V5	VALVE, EXPANSION
V6	VALVE, CHARGING WITH CAP

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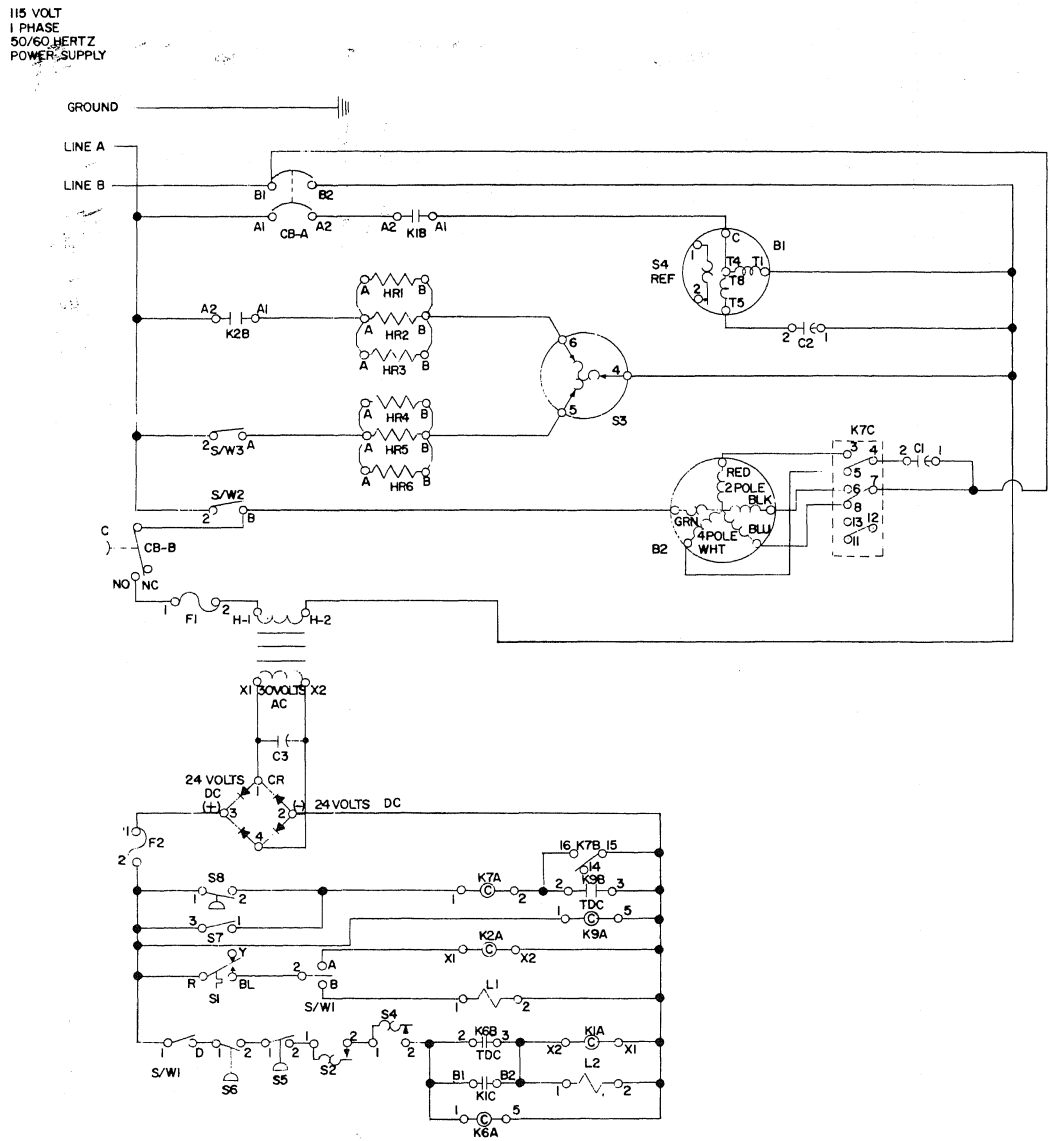
Figure 1-6. Refrigerant fluid diagram.

Figure 1-6



	LE
SYMBOL	
B1	COMPRESSOR MOTOR
B2	FAN MOTOR
C1	CAPACITOR - FAN MOTOI
C2	CAPACITOR - COMPRESS
CB	CIRCUIT BREAKER
CR	RECTIFIER, SEMICONDUC
F1, F2	FUSE
K1	RELAY - COMPRESSOR
K2	RELAY - HEATER
L1	SOLENOID VALVE - LIQUI
L2	SOLENOID VALVE- PRESS
K6	TIME DELAY RELAY
S/W1-S/W3	ROTARY SWITCH
S1	THERMOSTAT - TEMPER/
S2	THERMOSTAT - OUTSIDE
S3	THERMOSTAT - HEATER
S4	THERMOSTAT - COMPRES
S5	HIGH PRESSURE CUT-OUT
S6	LOW PRESSURE CUT-OUT
S7	SWITCH FAN, HI-LO SPEE
T	TRANSFORMER
HR1-6	HEATING ELEMENT
K7	FAN SPEED RELAY
S8	HIGH PRESS. FAN SPEED
K9	RELAY, TIME DELAY
C3	CAPACITOR, RFI

	SWITCH PO		
	CONTACT NO.	1 HI HEAT	2 LO HE
S/W1	2 & A	CLOSED	CLOSI
	2 & B	OPEN	OPEN
	1 & D	OPEN	OPEN
S/W2	2 & B	CLOSED	CLOSI
S/W3	2 & A	CLOSED	OPEN

Figure 1-7. Schematic wiring diagram.